Queen's University

KINGSTON, CANADA

INCORPORATED BY ROYAL CHARTER IN 1841

CALENDAR

OF

THE FACULTY OF APPLIED SCIENCE

FORTY-SEVENTH SESSION

1939-1940

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PRINTED FOR THE UNIVERSITY BY
HANSON & EDGAR
KINGSTON
1939

CALENDAR

1939

JANUARY

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TABLE OF CONTENTS

ACADEMIC YEAR

1939

May 1 Written notice due at the Registrar's Office of candidates' intention to compete for Provincial Scholarships and Ontario Matriculation Scholarships.

July 15 Last day for applying for September examinations, or for degrees. Students applying after this date will be required to pay a late fee of $3.

Aug. 24 Shop Work for Courses F. and G. begins.

Aug. 29 Arts Supplemental Examinations begin.

Sept. 1 Last day for receiving applications for the Robert Bruce Bursaries.

Sept. 7, 8, 9 Supplemental Examinations in Applied Science.

Sept. 11 Surveying Field Class opens.

*Sept. 26 Registration of First Year Students. Late fee after this date. ($3 on Wednesday and $1 more for each day after that date).

Sept. 27 Classes of First Year open at 8 a.m.

Sept. 27 Registration of Second, Third and Fourth Years. Late fee after this date, ($3 on Thursday and $1 more for each day after that date.)

Sept. 28 Classes of Second, Third and Fourth Years open at 8 a.m.

Oct. 7 Last day of registration (with extra fee) of students in Applied Science who have not previously obtained from the Faculty permission to register later.

Dates of the Christmas examinations for 1st and 2nd years to be announced.

Dec. 21 Christmas holidays begin at 5 p.m.

1940

Jan. 3 Final examinations in half courses begin.

Jan. 8 Classes re-open (2nd term) at 8 a.m.

Feb. 16-17 Mid-term holiday.

Mar. 15 Last day for receiving applications for graduation.

Mar. 22 Good Friday.

Apr. 1 Last day for receiving manuscripts and essays for prizes.

Apr. 6 Classes close at 12 o'clock noon.

Apr. 10 Examinations begin.

May 17 Convocation for distributing prizes, announcing honours and conferring degrees. (This date is provisional).

A student entering the Faculty of Applied Science for the first time must submit a certificate showing successful vaccination.

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Retire 1940

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Alexander Longwell, B.A., B.Sc.[1]	Toronto, Ont.
J. C. Macfarlane, M.A., K.C.[1]	Toronto, Ont.
A. E. MacRae, B.Sc.[7]	Ottawa, Ont.
Rev. Leslie Pidgeon, B.A., D.D.[6]	Montreal, P.Q.
Fraser D. Reid, B.Sc.[4]	Toronto, Ont.
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Retire 1941

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V. K. Greer, M.A.[3]	Toronto, Ont.
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O. D. Skelton, M.A., Ph.D., F.R.S.C., LL.D.[3]	Ottawa, Ont.
R. M. Smith, B.Sc.[6]	Toronto, Ont.

Retire 1942

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Retire 1943

D. K. MacTavish, B.A., K.C.[2]	Ottawa, Ont.

1Elected by the University Council for three years.
2Elected by the Benefactors for four years.
3Elected by the Graduates for three years.
4Elected by the Board of Trustees to represent the Faculty of Applied Science for three years.
5Elected by the Faculty of Queen's Theological College for one year.
6Elected by the Board of Trustees for four years.
7Elected by Benefactors to represent the Faculty of Applied Science for three years.

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Retire 1942

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Retire 1944

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J. D. Stewart, M.A.,
Lecturer in Mathematics, 404 Albert Street.

M. W. Huggins, M.A.Sc.,
Lecturer in Civil Engineering, 109 Wellington Street.

G. A. Revell, M.Sc.,
Lecturer in Chemical Engineering, 36 Wellington Street.

E. G. Taylor, B.Sc., Sc.M., Ph.D., (Wales) A.I.C.,
Lecturer in Chemistry, 152 University Avenue.

Instructor in Chemistry: J. A. Martin, M.A.

Instructor in Physical Training: J. G. Bews.

Instructor in Shop Work: A. C. Baiden.

Instructor in Blacksmithing: W. E. Connolly.

Assistant Instructor in Physical Training: J. F. Edwards, B.A.

ASSISTANTS AND DEMONSTRATORS

Physics: J. E. Kennedy, B.A., C. M. Cross, B.A.

Chemistry: A. J. Abbott, B.Sc., H. K. Coulthart, B.A., A. K. Edwards, B.Sc., J. E. Hanna, B.A., J. A. Pearce, B.A.

Mining and Metallurgy: J. T. Corkill, B.Sc., W. M. Robinson, B.Sc.

Draughting: A. O. Monk, B.Sc.

Electrical Engineering: D. M. Bews, B.Sc., R. A. Doherty, B.Sc.

Mechanical Engineering: H. A. Davis, B.Sc.

Geology: W. C. Güssow, M.Sc., Ph.D., W. T. Love, B.Sc., H. F. Morrow, B.Sc.

Mineralogy: W. J. McGill, B.Sc.

Civil Engineering: A. Dolan, B.Sc., C. O. P. Klotz, B.Sc.

UNDERGRADUATE ASSISTANTS AND DOUGLAS TUTORS

N. Z. Alcock, L. S. Brooks, W. W. Donaldson, L. G. Henry, J. A. Jarvis, R. W. Kraft, J. A. McLaren, W. M. Newby, E. W. Niergarth, G. M. Robson, R. G. Rowan, C. N. Simpson, N. J. Southern, J. A. Waghorne, W. A. Young.

OTHER OFFICERS

LIBRARIAN

E. C. Kyte

CURATORS OF THE LIBRARY

Principal Wallace, Principal Kent, Vice-Principal McNeill, Dean Clark, Dean Matheson, Dean Etherington, Professors M. B. Baker, James Miller, Knox, Roy and Shaw.

CURATORS OF THE MUSEUM

The Professors of Biology and Geology

DIRECTOR OF ENDOWMENT

Gordon J. Smith, B.A., B.Sc.

DIRECTOR, DEPARTMENT OF UNIVERSITY EXTENSION

R. M. Winter, M.A.

SUPERINTENDENT OF BUILDINGS

James Bews

SECRETARY-TREASURER ATHLETIC BOARD OF CONTROL

Charles Hicks

ACTING SECRETARY-TREASURER GENERAL ALUMNI ASSOCIATION. MANAGER OF EMPLOYMENT BUREAU

H. J. Hamilton, B.A.

MEDICAL OFFICER

J. T. Tweddell, M.D., C.M.

ADMINISTRATION AND GOVERNMENT

The administration of the University is vested in the Board of Trustees, the University Council, the Senate, and the Faculty Boards.

THE BOARD OF TRUSTEES

The Board of Trustees consists of *ex-officio* and elective members. The former are the Chancellor, the Principal and the Rector. The latter consist of (1) one representative from each affiliated college, (2) representatives as provided for by the Statutes from (*a*) the University Council, (*b*) the Benefactors, (*c*) the Graduates, and (3) members elected by the Board of Trustees.

The functions of the Board of Trustees are to manage the finances, to possess and care for the property, to procure legislation, to appoint instructors and other officers, and in general to attend to such external matters as do not relate directly to instruction.

THE UNIVERSITY COUNCIL

The University Council consists of the Chancellor, the Trustees, the members of the Senate, and an equal number of members elected by the graduates from their own members.

The Functions of the Council are:

(1) To elect the Chancellor, except when two or more candidates are nominated, in which case the election is by registered graduates.

(2) To elect six trustees, two of whom shall retire annually.

(3) To make by-laws governing the elections of (*a*) the Rector by the registered students, (*b*) seven trustees by the benefactors, (*c*) six trustees by the University Council, and (*d*) six trustees by the graduates.

(4) To discuss all questions relating to the University and its welfare.

(5) To make representation of its views to the Senate or the Board of Trustees.

(6) To decide on proposals for affiliation.

(7) To arrange all matters pertaining to (*a*) its own meetings and business, (*b*) the meetings and proceedings of Convocation, (*c*) the installation of the Chancellor, and (*d*) the fees for membership, registration, and voting.

Ordinarily the annual meeting of the Council is held on the day before the spring Convocation.

THE SENATE

The Senate consists of:

The Principal.
The Vice-Principal.
The Principal of Queen's Theological College.
The Dean of the Faculty of Arts.
The Dean of the Faculty of Applied Science
The Dean of the Faculty of Medicine.
Three Professors elected by the Faculty of Arts.
Three Professors elected by the Faculty of Medicine.
Three Professors elected by the Faculty of Applied Science.
Two Professors elected by the Faculty of Queen's Theological College.
The Registrar.

The Functions of the Senate are:

(1) To determine all matters of an academic character which concern the University as a whole.

(2) To consider and determine all courses of study leading to a degree, including conditions of Matriculation, on recommendation of the respective Faculty Boards; but the Senate shall not embody any changes without having previously presented these to the Faculty.

(3) To recommend to the Board of Trustees the establishment of any additional Faculty, Department, Chair, or Course of Instruction in the University.

(4) To be the medium of communication between the Alma Mater Society and the Governing Boards.

(5) To determine all regulations regarding the social functions of the students within the University, and regarding the University Library and University Reading Rooms.

(6) To publish the University Calendars.

(7) To conduct examinations.

(8) To grant Degrees.

(9) To award University Scholarships, Medals and Prizes.

(10) To enforce the Statutes, Rules and Ordinances of the University.

(11) And generally, to make such recommendations to the Governing Boards as may be deemed expedient for promoting the interests of the University.

THE FACULTY BOARDS

The Faculty Boards are constituted as follows:

For the Faculty of Arts and for the Faculty of Applied Science, the Dean, Professors, Associate Professors, Assistant Professors, and Lecturers of each Faculty have power to meet as separate boards, and to administer the affairs of each Faculty under such regulations as the Board of Trustees may prescribe.

For the Faculty of Medicine, the Dean, Professors, Associate Professors, and Assistant Professors have power to meet as a separate board, and to administer the affairs of the Faculty under such regulations as the Board of Trustees may prescribe.

The Principal and Vice-Principal are *ex-officio* members of each of the Faculty Boards.

The Functions of the Faculty Boards are:

(1) To recommend to the Senate courses of study leading to a degree, and the conditions of admission.

(2) To decide upon applications for admission or for change of course, subject to the regulations of the Senate.

(3) To submit to the Senate names for both ordinary and honorary degrees.

(4) To arrange the time-table for classes and to edit the Faculty Calendar, subject to the approval of the Senate.

(5) To control registration, and to determine the amount of fees and manner of payment, subject to the regulations of the Senate and the approval of the Board of Trustees.

(6) To deal with class failures.

(7) To exercise academic supervision over students.

(8) To make such recommendations to the Senate as may be deemed expedient for promoting the efficiency of the University.

(9) To award Faculty Scholarships, Medals and Prizes.

(10) To appoint, within the limits of the funds made available by the Trustees, such sessional assistants, fellows, tutors and demonstrators as shall be needed to give instruction in the subjects taught by the Faculty.

(11) To pass such regulations and by-laws as may be necessary for the exercise of the functions of the Faculty.

HISTORICAL NOTE

The School of Mining, now the Faculty of Applied Science, Queen's University, was founded in 1893 under an Ontario Charter which placed its management in the hands of a Board of Governors elected by its shareholders, i.e., the subscribers to its funds. While originally a Mining School it has been expanded to include courses of study for degrees in mining and metallurgy, in civil, mechanical, electrical and chemical engineering, in analytical chemistry and assaying, in physics, and in geology and mineralogy. The objects of the institution were to provide thorough instruction both theoretical and practical, in the above and other branches of applied science, and to adapt courses of study and methods of presentation to the conditions prevailing in Canada, so as to secure as nearly as may be a maximum usefulness to the country.

For several sessions all its Departments were housed in Carruthers Science Hall, which had been erected in 1889, but in view of the rapid success and increased requirements of the School the Provincial Legislature in 1900 provided for its accommodation two large buildings, Ontario Hall for the Departments of Mineralogy, Geology and Physics, and Fleming Hall for the Departments of Civil, Mechanical and Electrical Engineering. More recently the Provincial Government erected Gordon Hall, which is entirely devoted to Chemistry; and, through the generosity of Professor Nicol and other graduates, Nicol Hall was built for the accommodation of the class rooms and laboratories of the Department of Mining and Metallurgy. These changes permitted the Civil Engineering Department to move into Carruthers Hall, leaving room in Fleming Hall for the already overcrowded departments of Electrical and Mechanical Engineering. Miller Hall, one of the finest buildings on the campus, was opened in 1931 for the Departments of Mineralogy and Geology, permitting the Department of Chemical Engineering to move into Ontario Hall.

From its inception the School of Mining was closely connected with the University. The students of the School of Mining received their degrees

from the University and the graduates in Science enjoyed the same rank and privilege as other graduates in representation upon the University Council and in the election of University Trustees. The staff of the School of Mining constituted practically the Science Faculty of the University, some of its members being actively connected also with the Arts and Medical Faculties, and the Faculty being represented with other faculties on the Senate of the University.

The School of Mining was formerly under the control of a separate board of Governors, but in the year 1916 it became the Faculty of Applied Science of Queen's University.

Kingston is well situated as the seat of a college of engineering and applied science. Geology and mineralogy, two of the fundamental subjects of a mining engineer's education and also important in other scientific professions, are studied to best advantage where the minerals can be seen as they lie in nature, and where geological formations can be examined *in situ*. In a few hours a class of students can be taken to a region so rich in mineral species that about forty different kinds have been secured in an afternoon. There are several geological formations out-cropping within easy walking distance of the city. If to this be added the accessibility by a short railway journey of mines in operation, it will be seen that the opportunities for instructive demonstrations to classes in mineralogy, geology and mining are very numerous. The metallurgical works at Deloro, eighty miles from Kingston, are also open to our students. It is thus possible to give to the study of mineralogy, geology, mining and metallurgy, that practical turn which not only adds interest to the college course, but shortens the period between graduation and the attainment of proficiency and of confidence in professional work.

The variety of topographical features in the surrounding country affords the best of material for practice in all branches of surveying, including railway, topographic, hydrographic and land surveying. The main line of the Canadian National passes through Kingston, which is also a terminus of the Canadian Pacific Railway. The Canadian Locomotive Works, which are the largest locomotive shops in Ontario, are within ten minutes' walk of the University, and are open to students for study and for assisting in engine testing and similar work. Kingston has a large Dry Dock, in whose yards steel construction can be studied practically. The locks of the Rideau Canal can be visited at Kingston Mills, six miles from the heart of the city. There are also several water powers within easy distance. Students of civil, mechanical and electrical engineering thus have easy access to practical illustrations of their professional studies.

EQUIPMENT AND SPECIAL FACILITIES

THE LIBRARY

The Douglas Library building provides one large reading room, three smaller ones, a number of conference rooms, exhibition rooms and offices for the library and administrative staff.

In the main reading room will be found a collection of some 5,000 volumes of general reference works on open shelves. The general library includes about 160,000 volumes as well as many original manuscripts and prints.

The system of classification used is that of the Library of Congress.

Seven hundred and fifty journals and other serials are currently received.

In addition to the general library there are departmental libraries for physics; chemistry; chemical engineering; mining and metallurgy; geology and mineralogy; civil, mechanical and electrical engineering.

The library of the Medical Faculty together with a biological library, is separately housed in the Old Arts Building.

The Lorne Pierce Collection of Canadian Literature is very rich in first editions, original manuscripts and rare Canadiana.

The Shortt-Haydon Collection of portraits and views relating to Canada is one of the finest collections of its kind.

THE MUSEUMS

The Miller Memorial Museum, named in memory of the late Willet G. Miller, formerly Provincial Geologist of Ontario, has recently been erected for the Departments of Geology and Mineralogy. The main floor is entirely devoted to museum purposes and contains among other things an excellent collection of economic minerals used in industrial processes; a collection of at least a thousand mounted individual crystals, large collections illustrating the systematic classification of minerals and rocks; another illustrating the ores found particularly in Canadian mines, a stratigraphic assembly of rocks and a paleontological collection illustrating the geologic life record.

An Ethnological collection of weapons, utensils, dresses and ornaments is also housed in the east wing of the museum.

The Biological Museum, in the Old Arts Building, has a large Botanical collection illustrating fully the flora of North America, Europe, Asia, South Africa, and Australia; a Zoological collection representing the Canadian fauna by a large number of prepared specimens of mammals, birds, reptiles, fishes, insects, and mollusca.

THE LABORATORIES

The Chemical Laboratories are in Gordon Hall. On the fourth floor are the laboratories of Medical Organic, Biochemistry, and Water Analysis.

On the third floor are two laboratories for General Chemistry, and a laboratory for Electro-chemistry and Colloid Chemistry. On the second or main floor are two laboratories for Quantitative Analysis, two for Organic Chemistry, and one for Industrial Chemistry. On the first or basement floor are three laboratories for Qualitative Analysis, and two for Physical Chemistry. Besides these there are a number of small separate laboratories for research work.

The Physics Laboratories occupy the major part of Ontario Hall. The basement contains the large elementary laboratory, the liquid air room, numerous research laboratories and the research workshop. The main floor is given over to undergraduate lecture and laboratory rooms. The second floor has two large lecture rooms, laboratory room for advanced undergraduate classes and for research. The attic is used for workshop and storage purposes.

The Geological and Mineralogical Laboratories are in Miller Hall. In the basement is a laboratory for the preparation of rock sections and for photography and an X-ray laboratory equipped with a Hilger X-ray spectrograph. On the second floor a laboratory occupying the west wing is for elementary classes in Geology. Along the north side of the building is a map room and the petrographical laboratory. On the south side a large draughting room is used by senior students for the preparation of maps and sections required in field courses. On the third floor at the west end is a large laboratory for blowpipe analysis, a dark room equipped with a two circle goniometer, a monochromator and Abbé refractometer. The east wing is a laboratory for postgraduate students, a dark room for photography, a chemical laboratory with space for twelve students, a grinding room for preparation of polished surfaces and an adjoining optical laboratory for petrographic and mineralographic work. Smaller laboratories for research work are equipped with a Hilger E316 spectrograph, a Hallimond Electromagmatic concentrator and facilities for examination of ores by polarized light.

The Biological Laboratories are on the main floor and in the basement of the Old Arts Building. There is a large laboratory for General Botany, one for General Zoology, and one for Medical Biology, as well as smaller laboratories for Plant Physiology and Advanced Botany. Laboratories are available also for research in Plant Physiology, Cytology, and the growth of populations. A very carefully arranged and classified collection of representative invertebrate animals as well as a small but growing entomological collection are available for study. These supplement the Herbarium and the collection of larger animals in the Museum.

THE OBSERVATORY

The Observatory has a transit room, a computing room, and an equatorial room with revolving dome. The equatorial telescope has a six-inch objective, declination and right ascension circles, and a driving clock. The transit has a

three and a half inch objective. The further equipment consists chiefly of a striding level, a chronograph, a mean time clock, and a sidereal time clock.

FACILITIES FOR FIELD WORK

Geology and Mineralogy. In the vicinity of Kingston a greater variety of economic minerals and metalliferous ores is mined than in any similar area in Canada. Through the kindness of the managers the various mines may be visited by the Geology and Mineralogy classes, and students may thus obtain valuable information concerning field conditions.

Botany and Zoology. Exceptionally good facilities for field study are provided in the vicinity of Kingston by the great diversity of land surfaces and bodies of water. A wide range of plant and animal associations are within easy reach of the University.

ENGINEERING SOCIETY

The representative student organization of the Faculty of Applied Science is the Engineering Society. All students registered in the Faculty of Applied Science are members of this society. Regular monthly meetings are held and the Society has been fortunate, in recent years, in securing successful engineers to address the students during the session. Any student member who wishes to read a scientific paper before the society will always find the executive of the Engineering Society ready and willing to arrange a date. Prizes are offered in connection with such student papers.

The Society conducts a Technical Supplies Department, where all books prescribed, stationery, note books, drawing paper and instruments, and other supplies, may be purchased at prices but slightly over cost. Any books not in stock will be ordered on payment of a small deposit.

FACILITIES FOR ATHLETICS

The University provides ample facilities for athletics. A new gymnasium, one of the finest in Canada, was built during the summer of 1930. In the University Grounds is a large covered skating rink with artificial ice. Adjoining the University is the football field, with the George Richardson Memorial Stadium given by Dr. James Richardson, now Chancellor of the University, in memory of his brother, Captain George Richardson, a Queen's graduate and a former athlete, who was killed in the Great War. There is room and equipment for all students who wish to take part in football, hockey, basketball, tennis, track athletics, swimming, boxing, fencing, or wrestling.

REQUIREMENTS FOR ADMISSION.

The number of students admitted to the first year of the Faculty of Applied Science is limited. Selection from applicants for admission will be made on the basis of their qualifications. Candidates must make application by September 1st on forms which may be obtained from the Office of the Registrar. This application must be accompanied by academic certificates, a certificate of successful vaccination, a photograph 2" x 3", and a fee of $10 which will be applied on tuition payable at registration. This fee will be returned up until one week before the opening of the session if the student notifies the University that he cannot register.

I.—ADMISSION BY MATRICULATION.

*A candidate for admission into the Faculty of Applied Science must present certificates showing standing in the following subjects of Pass and Honour Matriculation:

Part I. Pass Matriculation in the following subjects: *English, History (Canadian and Ancient) or Canadian History and Music, Mathematics, (Algebra and Geometry), Experimental Science (Physics and Chemistry) or Agriculture (Parts I and II), and any two of Latin, Greek, French, German, Spanish, Italian, or Arithmetic.* Arithmetic to be offered by candidates from technical schools only.

Part II. Honour Matriculation in the following subjects: *English, Mathematics (Algebra, Geometry, including Analytical Geometry, and Trigonometry with an average of 60%), Experimental Science (Physics and Chemistry), and one of Latin, Greek, French, German, Spanish or Italian, History, Biology.*

Note:—Honour Matriculation in History, or in Biology, or in a Foreign Language, not offered under Part II may be substituted for one of the of Part I.

Candidates specially qualified for an Engineering Course may be admitted at the discretion of the Faculty, on conditions to be determined in each case, even though they do not present precisely the subjects named above. This provision applies to graduates of Technical Schools who have passed the regular matriculation examinations in the subjects taught in their schools, and to candidates with practical engineering experience.

Candidates entitled to enter the Faculty of Arts may satisfy the requirements of Part II by extra-mural and Summer School work.

*The experience of many years has shown that a good foundation in, and a liking for mathematics are essential for success in a Science Course.

II.—ADMISSION BY EQUIVALENT EXAMINATION

The following certificates are accepted provided that the subjects covered are the same as the subjects of Ontario Junior Matriculation.

Alberta	Third Year High School.
British Columbia	Junior Matriculation (Grade XII).
Manitoba	Grade XI.
New Brunswick	Junior Matriculation.
Newfoundland	Associate (Junior).
Nova Scotia	Grade XI.
Ontario	Middle School.
Prince Edward Island	First Class Teachers' License or Second Year Certificate from Prince of Wales College.
Quebec	Quebec School Leaving Certificate. McGill Junior Matriculation.
Saskatchewan	Grade XI.

Any one of the following certificates will be accepted in place of Honour Matriculation in the same subjects if the required standing has been made in the subjects covered.

Alberta	Fourth Year High School.
British Columbia	Senior Matriculation (Grade XIII).
Manitoba	First Class.
New Brunswick	Grammar School.
Newfoundland	Associate Grade.
Nova Scotia	Grade XII.
Ontario	Upper School.
Prince Edward Island	Honour Diploma of Third Year, Prince of Wales College.
Quebec	McGill Senior Matriculation.
Saskatchewan	Grade XII.

NOTE.—A certificate from any school which is on the list of schools approved by any University or Technical College of recognized standing in the United States will be accepted as equivalent to matriculation examination *pro tanto.*

III.—ADMISSION TO ADVANCED STANDING

A student who transfers to Queen's University from another educational institution will be admitted to the year for which he is qualified. Ordinarily such a student must spend a minimum of two years in residence in order to obtain the Bachelor of Science degree.

In view of the fact that laboratory accommodation is limited it may be necessary to refuse admission to certain Courses.

A candidate for advanced standing must submit with his application a Calendar of the institution in which he has studied together with an official statement of the subjects passed and the standing made.

IV.—ADMISSION OF SPECIAL STUDENTS

Students not proceeding to a degree may take any classes for which they are prepared. The work in all classes is so arranged that those who wish to study, either for scientific interest or to improve their qualifications for any particular position, may profitably pursue their studies in the Faculty of Applied Science.

The Faculty will admit under this paragraph, as special students, only such candidates as are fitted to take part of the classes of a course. It will not admit as special students those whom, on account of previous poor records, it is no longer desirable to retain as regular students.

Prospective students under this section should correspond with the Dean of the Faculty of Applied Science in regard to the arrangement of such a course.

MEDALS, FELLOWSHIPS, SCHOLARSHIPS AND PRIZES

I.—MEDALS

Governor-General's Medal

The Governor-General's Medal is awarded each year to the student of the graduating class who has made the highest standing throughout the four years of his Course. A student who has failed in any year is not eligible. Grades obtained on supplemental examinations will not be included in determining the candidate's standing.

Departmental Medals

A medal may be awarded annually in each department to the student of the graduating class who has made the highest average standing in all subjects of the third and fourth years, and secured honour standing in his fourth year.

II.—GRADUATE FELLOWSHIPS AND SCHOLARSHIPS

Science Research Fellowships

1. Applications for Fellowships will be received by the Registrar up to May 1st. If no appointment is made by that date further applications will be received up to September 1st.

2. Fellows will be selected and the character of their work will be determined by the Department concerned in consultation with the Dean. The University reserves the right to dismiss a Fellow whose work is not satisfactory.

3. A student appointed to a Fellowship must carry on research work for the whole session and embody the results in a thesis. The research may take the form either of independent investigation or of assistance in an investigation carried on by some department. The Fellow may be required to undertake tutorial work not to exceed six hours a week.

4. The income of the Fellowship will be paid in five instalments, of which the last will be paid only after the thesis has been accepted. A candidate for degree at the May Convocation must submit his thesis by April 20. Except by special permission, other Fellows must submit their theses not later than September 20.

The Milton Hersey Fellowship in Chemistry

This Fellowship of the annual value of $400, has been endowed by Milton L. Hersey, M.Sc., LL.D., of Montreal. It is open to graduates of all universities and technical colleges.

William Neish Fellowship in Chemistry

This Fellowship of an annual value of $400 has been endowed by Ada E. Neish and Laura Neish Black of Kingston. It is open to graduate students in Chemistry from Queen's or any other University.

The holder of this Fellowship shall carry on research work at Queen's for the whole session under the direction of some member of the Department of Chemistry and embody the results in a thesis. The Fellow shall be required to give laboratory instruction or its equivalent not to exceed nine hours a week.

Royal Society of Canada Fellowships

Ten annual fellowships to be known as the Royal Society of Canada Fellowships, each of $1500, and open on equal terms to men and women, have been endowed for a period of five years through the generosity of the Carnegie Corporation. They are tenable at institutions of learning or research, save in exceptional circumstances outside of Canada, and are available for advanced research in Literature, History, Anthropology, Sociology, Political Economy, or allied subjects, in French or English; and in Mathematics, Chemistry, Physics, Geology, Biology, or subjects associated with any of these sciences.

An applicant for a Fellowship should be a graduate of a Canadian university or college, or should have received an equivalent training in a Canadian institution possessing adequate facilities in his particular subject, and, except in special cases, should have the Master's degree or its equivalent, or, preferably, have completed one or more year's work beyond that degree.

Applications, addressed to "The Secretary, Royal Society of Canada Fellowships Board, Ottawa, Canada," should contain particulars of the candidate's age and place of birth, a full statement of his academic career, with copies of original papers and any other evidence of his ability or originality in his chosen field; also an indication of the particular work he proposes to undertake, at what institution, and under whose direction; and should be supported by recommendations from the head of the department of the institution in which the candidate has studied, and from the instructors under whom he has chiefly worked. All these papers should be in duplicate.

Further particulars may be obtained from the Registrar.

The following graduates of Queen's have held these Fellowships:

Christine Rice, M.A., Ph.D., 1932-33.
Harold Williams Fairbairn, B.Sc., 1932-34.
George Alan Harcourt, M.Sc., 1933-34.
William Carruthers Güssow, M.Sc., 1936-37.
Archibald William Currie, B.A., B.Com., 1937-38.
John Stewart Marshall, M.A., 1938-39.

This Fellowship is not controlled by the University.

The Reuben Wells Leonard Fellowships

Under the will of the late Reuben Wells Leonard provision was made for four Fellowships of the value of $500 to be awarded to graduates of the Uni-

versity "who are willing and qualified to undertake independent research work in the interests of higher culture". These Fellowships are tenable only by students in attendance at Queen's.

Application must be made to the Registrar not later than April 1st.

Exhibition of 1851 Science Research Scholarship.

This scholarship, of the annual value of £250 stg., is awarded by Her Majesty's Commissioners for the Exhibition of 1851 to students who have given evidence of capacity for original research, and are under 26 years of age. A given number of scholarships are awarded annually to students in Canada recommended by the Universities approved by the Commissioners.

The nominee must be a British subject, must have been a bona fide student of science for three years, must have been a student of the University for a full year immediately before his nomination, must be a student of the University at the time of his nomination, and must pledge himself not to hold any position of emolument whilst holding the scholarship without special permission from the commissioners. He is recommended to the commissioners by the Senate of the University. The scholarship will be tenable ordinarily for two years and in cases of exceptional merit for three years. The scholar will, in the absence of special circumstances, be required to proceed to a country other than that in which he received his scientific training, and there pursue some investigation likely to promote technical industries or scientific culture. The particular investigation the student proposes to pursue must be stated before a scholarship can be awarded.

Students of the Faculty of Applied Science are eligible for this scholarship.

Recommendations must be received at the office of the Commissioners before June 1.

The following Science Research scholars have been appointed from Queen's University:

Norman R. Carmichael, M.A., 1894.
Thomas L. Walker, M.A., 1896.
Frederick J. Pope, M.A., 1898.
W. C. Baker, M.A., 1900.
C. W. Dickson, M.A., 1901.
C. W. Knight, B.Sc., 1904.
F. H. McDougall, M.A., B.Sc., 1905.
Campbell Laidlaw, B.A., M.D., 1907.
N. L. Bowen, M.A., B.Sc., 1909.
Walter A. Bell, B.Sc., 1911.
John R. Tuttle, M.A., 1913.
Robert C. Cantelo, B.Sc., 1915.
Douglas G. H. Wright, B.Sc., 1921.
R. H. F. Manske, M.Sc., 1924.
Donald C. Rose, M.Sc., 1924.
H. M. Cave, M.A., 1926.
B. W. Sargent, M.A., 1928.
E. H. Charlesworth, M.A., 1931.
G. S. Farnham, M.Sc., 1932.

W. J. Henderson, M.A., 1932.
William Ernest Bennett, M.A., 1934.
John Stewart Marshall, M.A., 1935.
Arthur Gowsell Ward, M.A., 1937.

The Rhodes Scholarship

1. *General Regulations*:—A Rhodes Scholarship is tenable at the University of Oxford and may be held for three years. Since, however, the majority of Rhodes Scholars obtain standing which enables them to take a degree in two years, appointments are made for two years in the first instance, and a Rhodes Scholar who may wish to remain for a third year will be expected to present a definite plan of study for that period satisfactory to his College and to the Rhodes Trustees.

Rhodes Scholars may be allowed, if the conditions are approved by their own College and by the Oxford Secretary to the Rhodes Trustees, either to postpone their third year, returning to Oxford for it after a period of work in their own countries, or may spend their third year in post-graduate work at any university of Great Britain, and in special cases at any university on the continent of Europe, the overseas dominions, or in the United States, but not in the country of their origin.

The stipend of a Rhodes Scholar is fixed at £400 per year. At most Colleges, and for most men, this sum is not sufficient to meet a Rhodes Scholar's necessary expenses for Term-time and Vacations, and Scholars who can afford to supplement it by £50 per year from their own resources will find it advantageous to do so.

2. *Conditions of Eligibility*:—A candidate to be eligible must:

1. Be a British subject, with at least five years' domicile in Canada, and unmarried. He must have passed his nineteenth year, but not have passed his twenty-fifth birthday on October 1st of the year *for* which he is elected.

2. Have reached such a stage in his course at one of the Universities in Canada that he will have completed at least two years at the university in question by October 1st of the year *for* which he is elected.

Candidates may apply either for the province in which they have their ordinary private domicile, home or residence, or for any province in which they have received at least two years of their college education before applying.

In that section of the Will in which he defined the general type of scholar he desired, Mr. Rhodes wrote as follows:

"My desire being that the students who shall be elected to the scholarships shall not be merely bookworms, I direct that in the election of a student to a Scholarship regard shall be had to:

1. his literary and scholastic attainments;

2. his fondness for and success in manly outdoor sports such as cricket, football and the like;

3. his qualities of manhood, truth, courage, devotion to duty, sympathy for and protection of the weak, kindliness, unselfishness and fellowship, and

4. his exhibitions during school days of moral force of character and of instincts to lead and to take an interest in his schoolmates for those latter attributes will be likely in after life to guide him to esteem the performance of public duty his highest aim."

Full particulars may be obtained from D. R. Michener, 372 Bay St., Toronto, Secretary of the Selection Committee for the Province of Ontario. Two Scholarships may be awarded annually in the provinces of Quebec and Ontario if qualified candidates appear.

Each candidate for a Scholarship is required to make application to the Secretary of the Committee of Selection of the Province in which he wishes to compete, not later than November 10th. Application forms may be obtained from the Registrar's Office.

The following graduates of Queen's University have been awarded Rhodes Scholarships:

J. M. Macdonnell, M.A., 1905.
A. G. Cameron, B.A., 1906.
Norman S. Macdonnell, M.A., 1907.
Stanley Scott, B.A., 1911.
H. S. Smith, M.A., 1912.
A. G. Cumming, M.A., 1914.
H. R. MacCallum, B.A., 1919.
K. E. Taylor, B.A., 1920.
A. D. Winspear, B.A., 1922.
L. F. Kindle, B.A., 1925.
D. A. Skelton, B.A., 1926.
J. G. Davoud, B.A., 1936.
G. M. Brown, M.D., C.M., 1937.
G. P. Grant, 1938.

This Scholarship is not controlled by the University.

III.—SCHOLARSHIPS AND PRIZES

Scholarships are tenable in the session following award. By special permission of Faculty, the recipient of a Scholarship, available in the third and fourth years of his course, may postpone the use of the Scholarship for one year in order to engage in practical work connected with his chosen profession.

Scholarships and prizes are awarded on the standing obtained by a student on a regular year of work. A student who is repeating his year is not eligible.

A student who is awarded a University, Near, or Leonard Scholarship may not hold more than one additional Scholarship.

SCHOLARSHIPS FOR AWARD IN FIRST YEAR

University Scholarships

Four scholarships of $100 each, and four of $75 each will be awarded to students in the first year on the basis of the returns in all subjects having examinations, namely, English, Mathematics, Chemistry, Physics and Surveying.

The scholarships will be awarded at the May Convocation, and the money will be available in the next session provided that the student registers in the Faculty of Applied Science.

Robert Bruce Scholarships.

Under provisions of the will of the late Robert Bruce of Quebec the University has established a Scholarship worth about $75 in each of the Faculties of Arts, Applied Science, and Medicine. Until 1948 the award is limited to students of Scottish extraction.

The Scholarship in each Faculty will be awarded at the end of the first year to the student who has made the highest standing on the regular examinations of that year. One third of the value of each scholarship will be paid to the winner in each of the second, third, and fourth years of his Course provided that he is in attendance in the Faculty in which the award was made.

The N. F. Dupuis Scholarship.

Value $50. This scholarship has been founded by the graduates as a mark of their appreciation of the long and effective services of Dr. N. F. Dupuis, as Dean of the Faculty of Applied Science and Professor of Mathematics. The scholarship is of the value of $50, and is awarded to the student who makes the highest marks in Mathematics of the first year at the April Examinations.

The Dr. William Moffat Scholarship.

Value $20. This scholarship has been founded by Dr. William Moffat, of Utica, and is awarded annually to the student making the highest standing in first year chemistry. The award will be made on combined results of class work and examination.

William Wallace Near Scholarship

Value $100. Established under provisions of the will of the late William Wallace Near of Toronto. To be awarded to the student in the first year who has the highest average in all the work of the year.

SCHOLARSHIPS FOR AWARD IN SECOND YEAR

University Scholarships

Six scholarships of $100 each, to be awarded in sections A B C D and E F G in proportion to the registration in these sections, on the basis of the returns in all subjects having examinations, that is, in all subjects except Drawing and Shop Work.

Association of Professional Engineers Scholarship

Value $100. Founded by the Association of Professional Engineers of Ontario. Awarded in alternate years to the student in Courses ABCDM and EFGH who makes the highest average in the work of the second year. To be awarded to a student in EFGH in 1939-40.

Mowat Scholarship.

Value $40. Founded by the late John McDonald Mowat, B.A., '95. Awarded to the student in the Faculty of Applied Science who obtains the highest average on the examinations at the end of the second year.

William Wallace Near Scholarships

Value $100. Established under the provisions of the will of the late William Wallace Near of Toronto. To be awarded to the student in the second year who has the highest average in all the work of the year.

Dr. William H. Nichols Scholarship in Chemistry

Founded by Dr. William H. Nichols.

A Scholarship of the value of $40 will be awarded to the student obtaining the highest marks during the year in Qualitative Analysis I.

The P. D. Ross Scholarships.

Two scholarships of the value of $100 and $50 respectively. These scholarships are awarded annually to the students obtaining highest and second highest standing in the subjects common to the courses of the second year.

Science '11 Scholarship

Value $20. Awarded in the Faculty of Applied Science to the student with the highest average standing in the term work and examinations of the second year.

SCHOLARSHIPS AND PRIZES FOR AWARD IN THIRD YEAR

The Joseph Abramsky Scholarship in Mechanical Engineering.

Value $50. Founded by his sons in memory of the late Joseph Abramsky. Awarded to the student in the Faculty of Applied Science who obtains highest standing in Mechanical Engineering during his third year.

The Manley B. Baker Scholarships in Geology.

Founded by Agnes Moreland Baker. Two Scholarships of the value of $125 and $75 will be awarded annually to the students in the Faculties of Applied Science or Arts obtaining highest and second highest standing in the first three courses in Geology. These may include Mineralogy 10a (Arts) or Mineralogy III (Science). If two students are equal preference will be given to the one whose need is greater.

The Kenneth B. Carruthers Scholarships in Mining and Metallurgy.

Value $110 each. Founded in memory of Major Kenneth B. Carruthers, B.Sc., who was killed at Passchendaele in October, 1917. Two scholarships are awarded annually on the results of third year work, one to the student in Mining and Metallurgical Engineering (Course A) and the other to the student in Metallurgical Engineering (Course M) making the highest standing in the whole year's work.

Isaac Cohen Scholarship in Electrical Engineering

Value $100. Awarded to the student in the Faculty of Applied Science who has obtained at the end of his third year the highest standing in the following subjects: Hydraulics I, Mechanical Engineering I, Electrical Engineering II and III, Physics V, and Mathematics VII.

The Reuben Wells Leonard Fellowships

Under the will of the late Reuben Wells Leonard provision is made for two Scholarships of the value of $150 each and one of the value of $200. One of these Scholarships is awarded in each Faculty to the student standing highest at the end of his penultimate year. The student must be in residence in his final year.

Susan Near Scholarships

Five scholarships of the value of $100 each. Established under the provisions of the will of the late Susan Near of Toronto. To be awarded at the end of the third year by Departments in proportion to the

number of students in each Department. The exact distribution of scholarships will be announced at the beginning of each session. Eligibility for one of these scholarships requires an average of at least 66% on the work of the third year with no failures.

William Wallace Near Scholarships

Three scholarships of the value of $100 each. Established under the provisions of the will of the late William Wallace Near of Toronto. To be awarded at the end of the third year to the best students in each of the three Courses, Chemistry, Chemical Engineering, and Civil Engineering. Eligibility for one of these scholarships requires an average of at least 66% on the work of the third year with no failures.

Engineering Institute of Canada Prize.

Value $25. Awarded by the Engineering Institute of Canada to the student in any department of engineering, who, in the year prior to his graduating year, has proved himself most deserving, as disclosed by the examination results of the year in combination with his activities in the students' engineering organization, or with a local branch of a recognized engineering society.

Fifth Field Company Prize.

Value $40. The Fifth Field Company Prize is provided by funds accumulated for this purpose by the officers, N.C.O.'s and sappers of that unit since the war, and is given to the student of the third year in courses EF or G who makes the highest standing in Hydraulic Engineering I.

PRIZES FOR AWARD IN FOURTH YEAR

The L. M. Arkley Prize.

Value $40. This is a prize founded by the Scots Run Fuel Corporation of Morgantown, W. Va., in recognition of Professor Arkley's interest in the proper methods of purchasing, analyzing and burning coal. To be awarded to the fourth year student in Mechanical Engineering who gives evidence that he understands the sampling and analyzing of coal and submits, before April 1st of each year, the best paper on the phase of the subject assigned.

The E. T. Sterne Prize in Chemical Engineering.

Value $25. To be awarded to a student in Chemical Engineering after finishing his third year, for the best essay describing his summer's work. Essays to be handed in by December 31st. The donor desires that emphasis be laid on a discussion of the theoretical principles in Chemistry and Physics underlying any one of the manufacturing processes described.

GENERAL SCHOLARSHIPS AND PRIZES

B'nai B'rith Kingston, Bursary

Value $50. Founded by the B'nai B'rith Lodge of Kingston.

This Bursary will be awarded annually to a student of promising ability but straitened circumstances. The award will be made on the basis of the April examinations. Applications will be received up until April 1 of each year.

Prizes of The Canadian Institute of Mining and Metallurgy.

Premiums and prizes at the discretion of the Council may be given annually for papers read by student-members of the Institute and affiliated students during the year. Any such award will be made by the Council within three months after the Annual Meeting.

Engineering Society Prizes.

The Engineering Society of Queen's University offers two prizes of $15.00 and $10.00 for the two best papers on scientific subjects, by members of the society. These papers must be read before the society, and five papers, at least, must be presented before the prizes will be awarded. These prizes are open for competition to all students of Engineering.

Khaki University and Y.M.C.A. Memorial Fund

This fund is part of a sum, left from the Khaki University after the War, which was divided among the Canadian Universities.

The interest, amounting to $240, will be used to award one or more scholarships open to undergraduate students in any Faculty. In awarding these scholarships the need as well as the standing of applicants will be considered and preference will be given to returned men, or sons or daughters of soldiers of the Great War. Applications will be received by the Registrar up to April 1st.

George J. MacKay Prize in Metallurgy

Value $25. A prize given by the Mining and Metallurgical Society of Queen's University in memory of Professor George J. MacKay, formerly Head of the Department of Metallurgy at Queen's University. This prize will be awarded annually for seven years to the student in any year who submits, by February 1st, the best essay dealing with some branch of Metallurgy.

The A. E. Segsworth Prize.

Value $40. This is a prize founded by R. F. Segsworth, Esq., Toronto, in memory of his brother, A. E. Segsworth, B.A., Ph.D. The prize is awarded to the student of any year who hands in before December 1st the best account of his previous summer's experience in practical underground mining.

Prize of Society of Chemical Industry

Value $25. The Society of Chemical Industry offers an annual prize of $25 to be awarded to the undergraduate student in any branch of chemistry who presents a paper on his summer's work, or on any other chemical subject which he may select. This paper may be a thesis or paper required in his regular work of the year. The work or subject treated must relate to some branch of chemistry. Essays must be submitted not later than February 28th to the Secretary of the Ottawa Section of the Society of Chemical Industry. The successful competitor will be called upon to read his winning essay at a regular meeting of the Ottawa Section of the Society.

IV.—STUDENT EXCHANGES

It is probable that from time to time student exchanges will be arranged with French and German universities. Applications will be received by the Registrar from final year and graduate students.

V.—THE DOUGLAS TUTORSHIPS

At the beginning of session 1910-11 a gift from Dr. James Douglas, of New York, led to the establishment of a system by which first year students were tutored by men selected from the senior years. The instruction is given out of class hours and as each tutor gives his whole attention to not more than five students in a period, the result is that of individual teaching.

REGULATIONS

N.B.—Students taking the regular course are subject to all Rules and Regulations immediately upon publication, unless otherwise specified.

1. The Faculty may at any time, either during the term, or after the close of the term, require any student to withdraw whose conduct, attendance, work or progress is deemed unsatisfactory.

2. Registration.—Students of the first year must register and pay fees on the day before the opening of session. Students of other years will register and pay fees on the first day of session. A student who fails to register at the prescribed time must pay an additional fee of $3.00 on the first day with $1.00 for each day after that date, unless granted exemption by the Faculty. No student proceeding to a degree will be allowed to register after the seventh day of the session except by special permission of the Faculty, *which permission must be obtained before the opening of session.*

Any student entering the Faculty of Applied Science for the first time must submit a certificate showing successful vaccination.

3. Attendance.—Students are required to attend seven-eighths of their class lectures before permission will be given to write the examinations, and seven-eighths of their laboratory hours before their laboratory work will be certified. Exemption from this rule can be obtained only on application to the Faculty. All absences for whatever cause, including illness or late registration, must not exceed one-eighth of the total number of hours of work required in any subject.

4. Courses.—All students must take the subjects required in their courses in conformity with the calendars of their year of attendance. If a student wishes to change his course, he must first obtain the permission of the Faculty.

5. Sessional Examinations.—Sessional examinations are held in all the subjects prescribed in the various courses. Fifty per cent. is required in each subject for pass standing. In determining a student's standing at a sessional examination, professors are empowered to take into account his entire class record.

Regular students must take the April examinations in all subjects in which they are registered provided that examinations are held. Failure in more than four classes, including practical classes in which no written examinations are held, involves the loss of the session. A student failing in not more than four classes is given supplemental examinations in the following September, a mark of 55% being required on each examination. If he fails in more than one of these classes he may not proceed to the next higher year but must repeat a year's work, the time-table for which will be drawn up by a committee. If a student repeating the work of any year fails in classes enough to involve the loss of the year he must withdraw.

A student may not enter the third year until he has passed all the examinations of the first year; or the fourth year until he has passed all the examinations of the second year. Engineering Field Work I is regarded as a second year class and comes under this regulation both in respect to back classes and to admission to the fourth year. A student who is debarred from entering the third year because of back classes in the first year, or from entering the fourth year because of back classes in the second year, will not be allowed to write subsequent examinations in these classes without special permission from the Faculty.

6. Repeaters.—No student may repeat more than one year of his course except by special permission of the Faculty.

7. Mid-Term Examinations.—Examinations are held for all first year students about the middle of the Autumn term in the regular class hours.

8. Mid-Session Examinations.—Two hour examinations in all subjects are held for first and second year students the week before the Christmas vacation. A student repeating his first year who fails in four or more of these examinations will be required to withdraw from the faculty. A student repeating his second year who fails in more than four subjects will be required to withdraw. A proper proportion of fees paid will be refunded. The attention of all students is called to Regulation No. 1.

Final examinations are held at the beginning of the second term in all subjects in which the instruction terminates at that time. No other papers are set in these subjects until the following September.

9. Supplemental Examinations.—Unless specially excused by the Faculty upon application received at the Registrar's office before July 15th, all students who fail in one or more subjects of their year up to a total of four must write supplemental examinations in all such subjects in September of the same year, as a condition of admission to the next higher year of their course.

A student who has one failure in the April examinations of his final year must write this class off by the following April, a pass mark of 55% being required.

A student who has not been registered in the session in which he wishes to take any supplemental examinations must pay the registration fee of $10 in addition to the examination fee.

Students may take September examinations at approved outside centres if application is made by July 15th to the Registrar.

10. Penalty For Failure To Write.—If a student fails to write an examination from which he has not been excused by the Faculty, a penalty of $10 is charged. The student must pay in addition the regular supplemental examination fee of $10.00.

11. Practical Work.—Students are required to take the practical courses given in the calendar unless they have followed similar courses in other educational institutions, but instructors may, at their discretion, modify the work for students who have had experience in the field, in engineering works, etc. Such students may be set immediately at more advanced work than that required of those who have not had such experience.

12. Excursions.—The excursions are compulsory for all fourth year students in courses A, D, E, F, and G, and third year students in course B.

13. Vacation Work.—Before applying for a degree a candidate is required to submit certificates of having had at least six months' employment of a nature that in the opinion of the departments concerned shall have given him suitable experience in the practice of his profession.

14. Graduation.—Applications for degrees must be made before March 15 on forms which will be supplied by the Registrar.

GENERAL INFORMATION

EXPENSES

The following statement of expenses for a session in normal times is compiled from information obtained from students who have kept an account of their expenditures. Personal expenses are not included in the estimate.

Class, Hospital, Athletic and other fees	$255.00		$255.00
Board, lodging and washing	250.00	to	325.00
Books and Stationery	35.00	to	45.00
Excursions, Field and Technical	15.00	to	45.00
	$555.00	to	$670.00

The average student pays for board from $4.50 to $5.50 a week; and for a room from $2.00 to $3.00 a week. A few pay as little as $6.00 for board and room; whilst others, with more expensive tastes, pay over $8.00. Any student, however, may count on finding satisfactory board and lodging at from $6.50 to $7.50 a week.

Lists of Boarding Houses for men students may be obtained from the Registrar. Meals may be obtained at the cafeteria in the Students' Union.

PHYSICAL WELFARE OF STUDENTS

Every student is required upon registration to contribute $4 towards a health insurance fund. In return the student has the free services of the University medical officer and a special hospital rate of fifty cents a day. Details of the plan are given in a printed leaflet which may be had on request.

All students in their first year are required to take physical training for two hours a week, unless excused on account of military training with the Officers' Training Corps. They are examined by the University physician, who prescribes proper exercises to correct any physical defects.

VACCINATION

Every student registering for the first time must submit evidence of successful vaccination.

TUBERCULIN TESTS

Tuberculin tests will be given to all students entering Queen's University for the first time in September 1939. This service will be free of charge but those who react positively must have an X-ray examination at their own cost.

STUDENT SELF-GOVERNMENT

Queen's was the first University in Canada to introduce student self-government. All students are members of the Alma Mater Society, the chief instrument of student government, and are expected to share in its duties and responsibilities.

ALMA MATER SOCIETY LECTURE

In 1939, as a contribution from the student body to the Centenary Endowment Fund, the Alma Mater Society gave the University its accumulated reserve of $1711. The income will be used to provide an annual lecture to be known as the Alma Mater Society Lecture.

THE CANADIAN OFFICERS' TRAINING CORPS

The Queen's University Contingent of the C.O.T.C., formed at the outbreak of the Great War under Lieut.-Col. A. B. Cunningham, was organized as a Unit of the Militia in February, 1915. Reorganized after the war by Col. A. Macphail, C.M.G., D.S.O., it is now commanded by Lieut.-Col. R. O. Earl, and consists of three companies, "A" Coy. (Arts), "B" Coy. (Medicine), and "C" Coy. (Science).

The training, after the recruit year, prepares for examinations. "A" certificate qualifies for the rank of Lieutenant, and "B" certificate for that of Captain.

Commissions in the Permanent Force are offered from time to time to qualified members of the C.O.T.C. Students who enrol in their first year, complete the year's training, and are returned as fully efficient, are excused from Physical Training.

A Science student who obtains either certificate "A" or "B" in the Canadian Officers' Training Corps at Queen's may, on application, be given credit for the surplus marks which he obtains over his military pass mark either in the "A" or the "B" certificate examination or in both. This credit may be used to supplement the marks gained on any class which the student may select in his third or fourth year. If he has a surplus both in the "A" and in the "B" certificate he may use both credits separately in two selected classes of the third and/or fourth year, but both credits may not be used in the same year. In no case may this credit be reckoned for obtaining honours or prizes.

EMPLOYMENT SERVICE

An Employment Service has been in successful operation at the University for several years. It is under the jurisdiction of the Service Control Committee of the Engineering Society and administered by the Secretary of the General Alumni Association. It is financed by the Engineering Society and the University. The objects of the Service are to assist graduates in all Faculties to secure suitable positions, and to help students to obtain work during vacation periods.

Communications should be addressed: Manager, Employment Service, Queen's University.

FRATERNITIES

By resolution of Senate no student registered with the University may form or become a member of any chapter of any externally-affiliated fraternity or sorority at or near Kingston.

THE STUDENTS' MEMORIAL UNION

The Students' Memorial Union was built to commemorate the service of the students and graduates of Queen's in the Great War.

Every male student is a member of the Union, which is really a club, where the men of all Faculties may meet in a University building designed for that particular purpose and privilege.

There are the usual club facilities, dining room, lounge, billiard room, reading room and committee rooms.

FEES

Students will pay upon registration the Tuition Fees indicated below. A student may not attend classes until he has paid at least the first instalment of his fees, nor enter upon the work of the second term until he has paid his fees in full.

Sessional Fees (including registration, tuition, examination, degree, library, laboratory, health insurance and student interests. The fee for athletics, which is part of student interests, gives admission to all home games except play-offs) :—

If paid on registration $255.00
If paid in instalments:
1st payment on registration $130.00
2nd payment, on or before Jan. 6 ..... $130.00

Fifth Year in Commerce.

If paid in full on registration $150.00
Student Interests ..... $ 23.00

This includes all sessional fees.

(This year is taken in the Faculty of Arts under regulations of that Faculty.)

Deposits.—For covering expenses of breakages, etc., a first year student must deposit $5 with the Treasurer. If at any time the amount of breakages, etc., exceeds $3, an additional deposit of $5 must be made.

For second, third and fourth years the deposit is $5 except in the following courses:—

Second Year Courses A, B, C, D, M $10.00
Third Year Courses A and M 10.00
Third Year Courses B and D 15.00
Fourth Year Course B 15.00

Charges will be made for the use of platinum, and other expensive chemicals and apparatus. All money to the credit of the depositors will be returned at the end of the session on presentation of the deposit receipt properly certified.

The fees below are payable as they are incurred.

Special Charges.

Pro tanto allowance of courses	$10.00
Late registration. See Regulation 2	3.00
Supplemental Examination, one subject	10.00
Each additional subject	2.00
Writing at outside centre in April (if permitted)	5.00
Late application for supplemental examination or graduation	3.00
Special fee for Surveying Field Course	15.00

Fees for Single Classes.

Registration	10.00
Examination	10.00
Student Interests	23.00
Any course of lectures	20.00
Drawing, One Course, per Session	20.00
Surveying, One Course, per Session	20.00
Assaying Laboratory, per Session	10.00
Chemical Laboratory, per Session	20.00
Petrographical Laboratory, per Session	10.00
Mechanical, Electrical or General Engineering Laboratory, per Session	20.00

Fees for M.Sc. Work

*Total Sessional Fee (including laboratory fee, and student interests)	$143.00
Laboratory deposit	10.00

Additional charges may be made in the case of students requiring special material and apparatus.

*If a student decides to spread his work over two years, he will pay each year $87.50 for total sessional fee, and $10 for laboratory deposit.

In addition to regular examination fees, supplemental or otherwise, there will be the following fees for special examinations:

Examination in one paper	$ 5.00
Examination in two or more papers	10.00

Graduation and Other Fees

The Graduation Fee is payable before March 15. This fee is returned to unsuccessful candidates.

No graduation fee is charged for B.Sc. unless the degree is taken in absentia, in which case there is a charge of $10.00.

Graduation M.Sc.	$20.00
Admission *ad eundem statum*	10.00

DEGREES

I. Bachelor of Science.

1. The degree of B.Sc. will be given on the satisfactory completion of a four years' course in any one of the following departments:—

A. Mining Engineering.
B. Chemistry.
C. Mineralogy and Geology.
D. Chemical Engineering.
M. Metallurgical Engineering.
E. Civil Engineering.
F. Mechanical Engineering.
G. Electrical Engineering.
H. Physics.

A graduate in any course who desires to take the degree of B.Sc. in any other course, or a student desiring to change from one course to another, shall take all the classes which he has not already passed in that course or by examination satisfy the Department in charge of those classes as to his knowledge of the subjects involved.

Graduation with Honours.—Honour standing will be given to any student who graduates with an average of seventy-five per cent. or upwards on the full work of the fourth year of his course. Credit for Honour standing will be given on the diploma, and in the list of graduates a mark of distinction will be placed against the names of those graduating with Honour standing.

The following percentages are required for standing in all courses:

Division I.—.....75% and over
Division II.—..... 62 - 74%
Division III.—..... 50 - 61%

2. The degrees of B.A. and B.Sc. will be given on the satisfactory completion of a six years' course in Arts and Applied Science. See page 59.

A candidate for graduation must have completed either a four or a six years' course and have passed all the required examinations.

II. Master of Science.

The Degree of Master of Science (M.Sc.) is granted to candidates who have graduated with the B.Sc. degree and thereafter have been in attendance in the Faculty of Applied Science for at least one full session.

The work prescribed consists of two parts, as follows:

A. Research and Thesis representing not less than half the session's work. Except by special permission the thesis must be submitted by April 20. A candidate who is allowed to postpone his thesis must submit it by September 20 if he desires a degree at the fall convocation.

B. One or both of the following which must be cognate to the field of study and tested by examinations:

(a) Prescribed lecture courses. These, except by special permission of the Faculty, must be advanced courses (i.e. courses not offered for any B.Sc. degree). If allowed to take an undergraduate course, the candidate must pass a special examination of a standard higher than is exacted from B.Sc. candidates.

(b) Directed special studies with reports.

Written examinations will be set on the lecture courses prescribed and also on the directed special studies and a minimum standing of 66% must be made on each paper.

An oral examination will be given on the subject of the thesis.

Candidates must apply for permission to enter a M.Sc. course at least one week before the opening of the session.

No candidate who has not made an average of 66% in his final year will be accepted for the M.Sc. course except by special recommendation of the Department concerned.

A committee consisting of the Vice-Principal, the Dean, the Head of the Department concerned and the Professor or Instructor, selected to supervise the candidate's work shall report to the Faculty on his fitness to enter a M.Sc. course and recommend to the Faculty the prescribed programme of work. On the recommendation of this committee, the Faculty may decline to accept a candidate with the formal requirement of 66% if because of lack of space, equipment, time or for other reasons the department concerned finds itself unable to conduct the work.

A candidate in full time employment in the University or elsewhere will not normally be accepted as a candidate for the M.Sc.

THE INSTITUTION OF CIVIL ENGINEERS OF GREAT BRITAIN

The Council of the Institution of Civil Engineers of Great Britain has recognized the degree of B.Sc. of Queen's University obtained in the departments of Civil, Mechanical and Electrical Engineering as exempting from Sections A and B of the Institution Associate Membership Examination. Graduates in the departments of Mining and Metallurgy are exempt from Section B.

DOMINION LAND SURVEYORS

Revised Statutes Canada Chap. 117 Sec. 22, 1927

Every person who has followed a regular course of study in all the branches of education required for this act for admission as a Dominion Land Surveyor in any college or university where a complete course of theoretical and practical instruction in surveying is organized, and who, after examination, had thereupon received from such college or university a degree attesting to his completion of the said course of instruction, which degree shall be the degree of Bachelor of Science ———— shall be exempt from serving three years as aforesaid as an articled pupil, and shall be entitled to examination for a commission after being admitted upon examination as aforesaid as an articled pupil, and serving one year under articles with a Dominion Land Surveyor including six months' actual service with him in the field. ————

ONTARIO LAND SURVEYORS

Revised Statutes Ontario 1927, Chap. 201, Sec. 28 (1).

The privilege of a shortened term of apprenticeship shall also be accorded to any graduate of the ———— or to any graduate in Civil Engineering or of Mining Engineering ——— of Queen's University at Kingston, and such person shall not be required to pass the preliminary examination for admission to apprenticeship, and shall only be bound to serve under articles with a practicing surveyor, duly filed as required by section 31, during twelve successive months of actual practice after which on complying with all the other requirements he may undergo the examination for admission to practice.

COURSES.

A. Mining Engineering.
B. Chemistry.
C. Mineralogy and Geology.
D. Chemical Engineering.
M. Metallurgical Engineering.
E. Civil Engineering.
F. Mechanical Engineering.
G. Electrical Engineering.
H. Physics.

First Year, All Courses

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page.
English	2	0	61
Mathematics I.	2	0	63
Mathematics II.	2	0	63
Mathematics III.	2	0	63
Mathematics IV.	2	0	64
Projection	0	3	117
Physics I, & II	4	2	66, 67
Chemistry I. (1)*	3	3	71
Drawing I.	0	3	116
Surveying I.	0	2	105
	17	13	Total 30

Second Year

Courses A, B, C, D, M.

Mathematics V.	3	0	64
Descriptive Geometry	0	2	117
Physics XIV.	3a, 2b	4a, 2b	68
Qualitative Analysis I. (Chem. 2)*	2	6	73
Mineralogy I. (1)*	1a, 2b	2	84
Geology I.	2	0	80
General Engineering I.	2	0	98
Surveying II.	1	3	105
Drawing II.	0	3	116
	14a	20a	Total 34a
	14b	18b	Total 32b

*The No. of the same course given in the Arts Faculty.

Students in Courses A, C and E must take Surveying Field Work. See p. 106.

Courses E, F, G.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page.
Mathematics V.	3	0	64
Astronomy II.	1	0	65
Descriptive Geometry	0	2	117
Physics III.	2	2	67
Physics IV.	2	2	67
General Chemistry II.	2	0	72
General Engineering I.	2	0	98
Mechanical Engineering IX.	1	2	112
Surveying II.	1	3	105
Drawing III.	0	5a, 3b	117
Shop Work	0	3	115
	14	19a Total	33a
		17b Total	31b

Students in Courses A, C and E must take Surveying Field Work. See p. 106.

A.—MINING ENGINEERING.

This course is necessarily a very broad one, so that it may give a foundation for whatever branch of the profession a graduate may enter. Experience has shown that graduates do not usually follow any narrow differentiation which they make during their course, but are governed by many other factors in the practice of Mining Engineering. These factors are often out of their control, and the wisest plan in a four years' course appears to be, not to specialize, but by a broad training in the final years to obtain a suitable introduction to any branch of the work.

There are, however, certain well known avenues towards professional work, such as a good training and a manipulative skill in drafting, chemical analysis, and surveying. These subjects are essential for almost any professional position in mining and metallurgy, and are therefore perfected as far as is possible while at college.

At the present time there are no summer classes, or summer field work in mining or metallurgy. Under these conditions the student can, usually, obtain practical and remunerative work during four or five months each summer. This work, if in connection with Mining, Metallurgy or Surveying is considered to be more useful as a training than practical work under academic supervision.

Visits are paid to mines and smelters. One trip at least is required of each student, the expense not to be more than twenty-five dollars.

First and Second Years

See Page 44.

Third Year

Before entering the third year in Mining Engineering it will be necessary for the student to satisfy the department that he is physically fit for the work he intends to follow. This refers particularly to examination of eyes and chest.

	Lect. Hrs. per week.	Lab. Hrs. per week	Page.
Surveying Field Work	2 weeks course		106
Quantitative Analysis I. (3)*	1	3	75
Mineralogy IV. (11)*	2	2	86
Geology IV.	1	0	81
Geology III. (b) (10b)*	2b	2b	80
Mining I.	2	2a, 1b	88
Ore Dressing	1a, 2b	0	90
Metallurgy II.	2	0	92
Thermodynamics I.	1	0	113
General Engineering V.	1	3	100
General Engineering III.	0	2	99
Electrical Engineering I.	2	2	106
Fire Assaying	1b	3b	94
	13a 17b	14a 18b	Total 27a Total 35b

Fourth Year

	Lect. Hrs. per week.	Lab. Hrs. per week	Page.
Mechanical Engineering IV.	2	0	111
Geology V.	1	0	81
Geology VIII. (15)*	2	0	81
Hydraulics IV.	2	0	102
Metallurgy IV.	3	0	92
Milling	0	9	90
Mining II.	3	2	88
Mining III.	0	3	89
Economics I.	3	0	62
Summer Essay			90
	16	14	Total 30

*The No. of the same course given in the Arts Faculty.

To those students who wish to do further work in Geology the following optional course in the fourth year is offered. Only specially recommended students will be allowed to take this course.

FOURTH YEAR, GEOLOGY OPTION

	Lect. Hrs. per week.	Lab. Hrs. per week	Page.
Geology II.	0	2	80
Geology V.	1	0	81
Geology VII.	0	2b	81
Geology VIII.	2	0	81
Geology X.	0	3	82
Mineralogy II.	2b	2b	85
Mineralogy III.	2a	2a	85
Mineralogy VI.	0	3b	87
Mining II.	3	0	88
Milling	0	3	90
Metallurgy IV.	3	0	92
Hydraulics IV.	2	0	102
Mechanical Engineering IV.	2	0	111
Economics I.	3	0	62
Summer Essay			90
	18a	10a	Total 28a
	18b	15b	Total 33b

B.—CHEMISTRY (Industrial and Research)

This course is designed to fit men for the profession of expert chemists, teachers of chemistry, specialists in all industrial professions where chemistry serves as the basis of the industry. Graduates are fitted to do constructive work in research laboratories and in industrial plants.

FIRST AND SECOND YEARS

See Page 44.

THIRD YEAR

	Lect. Hrs. per week.	Lab. Hrs. per week	Page.
Quantitative Analysis II. (13)*	2	6a, 10b	75
Industrial Chemistry II. (17)*	2	3	77
Physical Chemistry I. (14)*	2	3	76
Organic Chemistry I. (12)*	2	3	73
General Chemistry III.	2	0	72
Metallurgy II.	2	0	92
Mineralogy III.	2a	2a	85
German A.	3	0	61
	17a	17a	Total 34a
	15b	19b	Total 34b

*The No. of the same course given in the Arts Faculty.

FOURTH YEAR

	Lect. Hrs. per week.	Lab. Hrs. per week	Page.
Organic Chemistry II. (22)*	2	6	74
Physical Chemistry II. (25)*	2	3	76
Physical Chemistry III. (24)*	2	3	77
Industrial Chemistry IIIa.	2a	3a	78
Colloid Chemistry II.	2	2a	79
Economics I.	3	0	62
Scientific German	2	0	62
Option in Chemistry			
General and Inorganic Chemistry IV, Organic Chemistry IV, Quantitative Analysis IV, Physical Chemistry IV or Industrial Chemistry IV.	0	9b	73-78
	15a	17a	Total 32a
	13b	21b	Total 34b

*The No. of the same course given in the Arts Faculty.

C.—MINERALOGY AND GEOLOGY

This course is designed to meet the requirements of students who desire a theoretical and practical knowledge of the constitution and history of the Earth. It furnishes a foundation for the professions of mineralogy, geological surveying, mining and consulting geology, and is useful for those who will in any way be connected with the discovery or the development of the mineral resources of the country. It forms a good postgraduate course for the mining engineer who wishes to understand thoroughly the groundwork of his profession. Since a knowledge of chemistry is essential for proper comprehension of many mineralogical and geological phenomena, considerable stress is laid on this science in the earlier part of the course. The departments of mineralogy and geology are furnished with well equipped laboratories for the physical and chemical examination of minerals, rocks and ores, and also with collections of illustrative material. Miller Hall, a very fine building in memory of the late W. G. Miller, was completed in 1931 and has a large museum on the main floor with fine specimens of minerals and fossils. Although field excursions are made during the session, students are advised to spend the summer vacations in practical field work.

First and Second Years

See Page 44.

Third Year

	Lect. Hrs. per week.	Lab. Hrs. per week	Page.
Surveying Field Work	2 weeks	course	106
Quantitative Chemistry I. (3)*	1	3	75
Physical Chemistry I. (14)*	2	3	76
Mineralogy III. (10a)*	2a	2a	85
Mineralogy II. (10b)*	2b	2b	85
Mineralogy IV. (11)*	2	2	86
Geology II. (11)*	2	2	80
Geology III. (10b)*	2b	2b	80
Geology VII. (14b)*	0	2b	81
Geology X.	0	4	82
Ore Dressing	1a, 2b	0	90
Biology XVa	2a	0	62
	12a	16a	Total 28a
	13b	20b	Total 33b

Fourth Year

	Lect. Hrs. per week.	Lab. Hrs. per week	Page.
Mineralogy V. (12)*	2	2	86
Mineralogy VI. (14b)*	0	3b	87
Geology V.	1	0	81
Geology VI. (13)*	2	0	81
Geology VIII. (15)*	2	0	81
Reports	0	4	83
Geology XII. (14a)*	2a	0	82
Mining IV.	1	0	89
Fire Assaying	1b	3b	94
Ore Dressing (For Session 1939-40 only)	1a, 2b	0	90
Economics I.	3	0	62
German A	3	0	61
Research and Thesis	0	6	87
	17a	12a	Total 29a
	17b	18b	Total 35b

Graduates in Course A or Course C who wish to take further work in Geology and Mineralogy are referred to the graduate courses in Geology, p. 59, and in Mineralogy, p. 87.

*The No. of the same course given in the Arts Faculty.

D—CHEMICAL ENGINEERING

Chemical Engineering is the application of the fundamental principles of Physics, Chemistry, Engineering, and Physical Chemistry, to the construction and operation of Chemical plant. The course must therefore be a broad one and avoid too narrow a specialization. Graduates have been found to enter the most diverse industries.

The first two years are the same as those for the Mining, Metallurgy and Chemistry students. Specialization begins in the third year, more time being devoted to Chemistry, whilst continuing fundamental courses in mechanical, civil and electrical engineering. Specialization is continued in the fourth year, with additional training in Chemical Engineering, Mechanical Engineering and Applied Thermodynamics.

The course aims at training students for research and operating positions in chemical and allied industries.

Visits are paid to local chemical works and to a number of the largest chemical plants outside of Kingston, attendance being compulsory. The expense of the outside trip in the fourth year does not exceed twenty-five dollars.

First and Second Years

See Page 44.

Third Year

Chemical Engineering D.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page.
Quantitative Chemistry I. (3)*	1	3	75
Physical Chemistry I. (14)*	2	3	76
Industrial Chemistry II. (17)*	3a, 1b	3a, 2b	95
Chemical Engineering I.	2b	0	95
Organic Chemistry I. (12)*	2	3	73
Thermodynamics I.	1	0	113
General Engineering III.	0	2	99
General Engineering V.	1	3	100
Electrical Engineering I.	2	2	106
Mechanical Engineering XII.	1	0	113
Mechanical Engineering III.	0	3b	110
	13a	19a	Total 32a
	13b	21b	Total 34b

FOURTH YEAR

Chemical Engineering D.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page.
Physical Chemistry II. (25)*	2	3	76
Colloid Chemistry Ia. (15a)*	1a	2a	78
Chemical Engineering II.	2	3	96
Chemical Engineering III.	1a, 2b	5a, 6b	96
Chemical Engineering IV.	2	0	97
Thermodynamics III.	2	3a	113
Mechanical Engineering IV.	2	0	111
Hydraulic Engineering IV.	2	0	102
Shop Work	0	3b	115
Economics I.	3	0	62
	17a	16a	Total 33a
	17b	15b	Total 32b

*The No. of the same course given in the Arts Faculty.

M—METALLURGICAL ENGINEERING

Metallurgy is divided into chemical metallurgy, the extraction of the metals from their ores and the refining of the metals, and physical metallurgy, the use of the metals and their alloys in the industries. The former requires in students a grounding in inorganic chemistry and its application in metallurgical processes; the latter, a grounding in physics and its application in the study of the constitution of alloys and their physical changes.

The first two years of the course are the same as those in Mining Engineering, Chemical Engineering and Chemistry. The engineering aspect of metallurgical work is to the fore in these preparatory years, and is kept in view during the third and fourth years.

In the third year specialization begins and particular stress is placed on inorganic and physical chemistry and chemical metallurgy. In the fourth year these are continued, while a foundation is laid in physical metallurgy in lecture room and well equipped laboratories.

As far as industrial conditions permit, students are required to work in mills or smelters during their summer vacations. For graduation an essay on some phase of this practical experience is demanded.

First and Second Years

See Page 44.

Third Year

	Lect Hrs. per week.	Lab. Hrs. per week.	Page
Quantitative Analysis I. (3)*	1	3	75
Physical Chemistry I. (14)*	2	3	76
Organic Chemistry V.	1	0	74
Thermodynamics I.	1	0	113
Mineralogy VIIa.	2a	0	87
General Engineering III.	0	2	99
General Engineering V.	1	3	100
Electrical Engineering I.	2	2	106
Mechanical Engineering XII.	1	0	113
Mechanical Engineering III.	0	3b	110
Metallurgy II.	2	0	92
Metallurgy III.	0	2	92
Ore Dressing	1a, 2b	0	90
Fire Assaying	1a	3a	94
	15a	18a	Total 33a
	13b	18b	Total 31b

Fourth Year

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Physical Chemistry II. (25)*	2	3	76
Metallurgy IV.	3	0	92
Mining IV.	1	0	89
Metallurgy V.	0	1	92
Metallurgy VI.	1b	0	92
Metallurgy VII.	0	2	93
Metallurgy Lab.	0	3	93
Metallography	1	3	93
Hydraulic Engineering IV.	2	0	102
Milling	0	9	90
Economics	3	0	62
Summer Essay	..	..	94
Mineralogy VIb. (b) optional	1b	3b	87
	12a	21a	Total 33a
	13b	21b	Total 34b

*The No. of the same course given in the Arts Faculty.

E.—CIVIL ENGINEERING.

The various branches of Civil Engineering—namely, Surveying, Structural Engineering, Municipal Engineering and Hydraulic Engineering, receive full consideration. During the earlier years of the course a sound training is given in Mathematics, Physics, Mechanics and other allied subjects, which are essential to the proper education of an engineer. In Surveying the student is made familiar with the various instruments and with the ordinary operations of Surveying practice. In Structural Engineering design and construction in masonry, concrete and steel is covered. In the testing laboratories materials of construction are tested. In Municipal Engineering —lectures on Highway work, and in Sanitary Engineering, in the fields of water-supply and sewage are given. Laboratory work in these fields enhances the value of the lecture work. In Hydraulic Engineering the design and construction of dams, power plants, and hydraulic structures is covered. The Laboratory work covers flow in closed and open conduits, pressures, flow of air, aerodynamics and allied problems.

First and Second Years

See Pages 44 and 45.

Third Year

	Lect. Hrs. per week.	Lab. Hrs. per week	Page.
Surveying Field Work	2 weeks course		106
Metallurgy I.	1	0	91
Thermodynamics I.	1	0	113
General Engineering II.	2	0	99
General Engineering III.	0	2	99
General Engineering VI.	1	3	100
Structural Engineering I.	1	3	100
Hydraulic Engineering I.	2	0	101
Surveying III.	1a	3a	105
Municipal Engineering I.	2b	3b	103
Railway Engineering I.	2	3	102
Electrical Engineering I.	2	2	106
Geology IX.	2	0	82
	15a	16a	Total 31a
	16b	16b	Total 32b

FOURTH YEAR

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page.
Industrial Chemistry I.	1	0	94
General Engineering IV.	0	3a	99
Municipal Engineering II.	1	0	103
Municipal Engineering III.	1	3b	103
Highway Engineering I.	1	3a	104
Structural Engineering II.	2	5a, 6b	101
Structural Engineering IV.	1	5	101
Mechanical Engineering IV.	2	0	111
Hydraulic Engineering II.	2	0	102
Hydraulic Engineering III.	0	3b	102
Economics I.	3	0	62
Engineering Economics	1	0	103
	15a	16a	Total 31a
	15b	17b	Total 32b

F.—MECHANICAL ENGINEERING.

Mechanical Engineering embraces the design, manufacture and operation of all classes of machinery, of power plants and manufacturing plants, as well as the executive management of industries. A four years' course must therefore be broad enough to give the student a thorough training in the fundamental principles, and not merely provide training for one of the many special branches of the profession.

The first two years are devoted to the study of the fundamental subjects of Mathematics, Physics, Chemistry and Mechanics, including experimental work in the various laboratories. Special attention is given to the strength of materials, with practice in testing during the second and third years. The study of the steam engine and of other forms of heat-engines includes courses in Thermodynamics, Valve Gears, Governors and the Balancing of Engines. Instruction is given in Mechanism, Machine Design, Shop Work, and the fundamental principles of Electrical Engineering. Instruction in drawing extends over the four years, and gives a thorough drill in modern drafting-room practice. In the more advanced courses of the fourth year the student is taught how to apply the general principles to the design and operation of special machinery, steam and gas engines, steam boilers and gas producers, and complete power plants; each student is allowed to specialize as far as is practicable. The instruction in the laboratories is intended not only to familiarize the student with standard methods of testing, but also to teach him how to attack original problems.

The fourth year students are kept in touch with manufacturing works in order to familiarize them with the practice of modern power plants and shops.

First and Second Years

See Pages 44 and 45.

Third Year

	Lect. Hrs. per week.	Lab. Hrs. per week.		Page.
Mathematics VI.	2a	0		64
Thermodynamics I.	1	0		113
Thermodynamics V.	2	2		114
General Engineering III.	0	2		99
General Engineering V.	1	3		100
Electrical Engineering IV.	2	2		107
Metallurgy I.	1	0		91
Mechanical Engineering I.	2	0		109
Mechanical Engineering II.	3b	0		110
Mechanical Engineering III.	0	6		110
Shop Work	0	3		115
Hydraulic Engineering I.	2	0		101
	13a	18a	Total	31a
	14b	18b	Total	32b

Fourth Year

Thermodynamics III.	2	3a		113
Thermodynamics IV.	0	5		114
Electrical Engineering VII.	2	2		108
Mechanical Engineering V.	3	6a, 3b		111
Mechanical Engineering VI.	2a, 1b	0		112
Mechanical Engineering VIII.	0	6b		112
Mechanical Engineering XI.	1	0		113
Hydraulic Engineering II.	2	0		102
Hydraulic Engineering III.	0	3b		102
Metallurgy VIII.	0	2a		93
Economics I.	3	0		62
	15a	18a	Total	33a
	14b	19b	Total	33b

G.—ELECTRICAL ENGINEERING

The instruction in the first two years of the course in Electrical Engineering provides for a thorough training in the fundamental subjects of Mathematics, Physics, Chemistry and Mechanics, including suitable work in the various laboratories. Part of the time is devoted to elementary drawing and shop work. In the third year the work consists of an introduction to the general principles underlying all electrical work together with elementary laboratory work. Considerable time is devoted to the study of Thermodynamics together with more advanced Mathematics and Physics. The fourth year is devoted to the study of the theory and action of the main types of electrical apparatus, the design and operation of central stations, electric lighting, electric railways and power transmission together with a thorough grounding in the principles underlying the electron tube.

An important part of the course consists in solving problems such as are frequently met with in practical work. In this way the student is trained in the application of theory to the solution of practical problems.

Arrangements are made for occasional visits to electrical works.

The whole course is designed to give the student a thorough understanding of the general principles which constitute the basis of all electrical work, together with some knowledge of their practical application. No effort is made to give that intimate knowledge of practical details which experience alone can supply.

Students are advised not to enter Course G unless they have taken a high standing in Physics III., Physics IV., and Mathematics V.

First and Second Years

See Pages 44 and 45.

Third Year

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page.
Mathematics VII.	2	0	65
*Physics V.	1	3	68
Thermodynamics I.	1	0	113
General Engineering III.	0	2	99
*Electrical Engineering II.	2	3	107
*Electrical Engineering III.	3	3	107
Electrical Engineering VI.	2b	0	108
Mechanical Engineering I.	2	0	109
Mechanical Engineering II.	3b	0	110
Mechanical Engineering VII.	0	3	112
Metallurgy I.	1	0	91
Hydraulic Engineering I.	2	0	101
	14a 19b	14a 14b	Total 28a Total 33b

*Students must pass these subjects before entering the fourth year.

Fourth Year

	Lect. Hrs. per week.	Lab. Hrs. per week	Page.
Electrical Engineering V.	4	6	107
Electrical Engineering VIII.	1	3	108
Electrical Engineering X.	1	3	108
Electrical Engineering XII	2	3	108
Hydraulic Engineering II.	2	0	102
Hydraulic Engineering III.	0	3a	102
Mechanical Engineering IV.	2	0	111
Metallurgy VI.	1b	0	92
Economics I.	3	0	62
	15a	18a	Total 33a
	16b	15b	Total 31b

H.—PHYSICS

This course is designed to fit men for positions as physicists in research laboratories and industries.

The importance of a thorough grounding in the fundamental subjects of Physics, Mathematics, and Chemistry, cannot be over-emphasized, so these subjects form the major part of the course. The engineer's point of view is acquired from the classes of the Faculty of Applied Science, while the breadth of view necessary for a research worker is gained from the advanced theoretical classes in the major subjects of the course. Students intending to take this course are urged to acquire a reading knowledge of French and German as early in the course as possible.

First Year

See Page 44.

Second Year

The Second Year of Any Course

See Pages 44 and 45.

THIRD YEAR

	Lect. Hrs. per week.	Lab. Hrs. per week.		Page
Mathematics VI.	2a	0		64
Mathematics XI. (16b)*	3b	0		65
Physics V.	1	3		68
Physics VI. (10b)*	3b	2b		69
Physics VII. (14a & 13b)*	3a, 2b	2a, 4 b		69
Electrical Engineering II.	2	3		107
Electrical Engineering VI.	2b	0		108
German A.	3	0		61
	11a	8a	Total	19a
	16b	12b	Total	28b

FOURTH YEAR

Mathematics X. (15b)*	3b	0		65
Physics IX. (16a & 20b)*	3	0		69
Physics X. (17b)*	3a, 2b	3b		70
Physics XIII.	0	6		70
Electrical Engineering VIII.	1	3		108
Electrical Engineering XII.	2	3		108
Scientific German or French	2	0		62
Economics I.	3	0		62
	14a	12a	Total	26a
	16b	15b	Total	31b

*The No. of the same course given in the Arts Faculty.

GRADUATE COURSE IN COMMERCE

The demand for engineers with business training has led to the establishment of a year's course in Commerce for graduates in Engineering of Queen's and other Universities.

The purpose of this course is to aid in preparing men who already have the technical equipment for work in the administrative or financial branches of industry.

A certificate will be awarded to students successfully completing the course.

Students who have not had an elementary course in Economics should read in preparation Clay, *Economics for the General Reader,* or McGibbon, *Elementary Economics for the Canadian Reader.*

The year's work will consist of five full courses or their equivalent, as follows:

1. Accounting and Statistics.
2. Business Finance.
3. Principles of Marketing *or* Money, Banking and International Trade.
4. Two half courses to be selected (e.g. Commercial Law, Investments, Cost Accounting, Transportation, Labour Problems).
5. A Thesis (Commerce 59).

For more detailed description of courses, see the Announcement of the Courses in Commerce and Administration.

GRADUATE COURSE IN GEOLOGY

The establishment of the Miller Memorial Research Chair in Geology has made it possible to give a year's graduate work in Geology.

The courses are planned to give to those men who have graduated in Mining Engineering, Geology option, the additional training in Geology that is needed for those who intend to undertake exploration and development work.

For those who intend to make Geology their profession a year's work satisfactorily completed at Queen's is equivalent to a year's graduate work at other universities and is accepted as such at some of the important graduate schools in Geology. It has the advantage of giving to graduates who intend to practice their profession in Canada an opportunity to study Canadian localities and problems in more detail than is otherwise possible since the collections of material from the important mineral deposits of the Canadian shield are large and fairly complete, and there is also in the vicinity of Kingston the opportunity for field study of the Pre-Cambrian rocks occurring.

Graduates in courses A, Geology option, and C in the Faculty of Applied Science at Queen's University and graduates in equivalent courses of other universities may proceed to the M.Sc. degree. (See p. 42). The courses are open only to graduates.

For outline of courses see page 83.

COURSE FOR B.A. LEADING TO THE DEGREES OF B.A. AND B.Sc. IN SIX YEARS

Students taking these courses are required to have Arts Matriculation and to register for the first two years in Arts alone and pay the class and registration fees in Arts; to register for the second two years in both Arts and Applied Science, to pay both registration fees, with examination fees as required, and the Applied Science class fees; and to register the last two years in Applied Science only, paying the registration and class fees. Arts classes are subject to the regulations in the Arts Calendar, and Applied Science classes to the regulations in the Science Calendar.

The courses for B.A. and B.Sc. must be taken as laid down in the following scheme. The regulations regarding back classes on page 34 will be applied on these courses.

FIRST YEAR

1. English 1.
2. French 1 or German 1.
3. Mathematics 1.
4. Mathematics IV. (Science).
5. *Physics 1.
6. *General Chemistry 1.

SECOND YEAR

1. English 2.
2. French 2 or German 2; or Latin, Greek, or Spanish.
3. Philosophy 1 or 2.
4. 5. Two of History 1, 3, Economics 4, Politics 2.

THIRD YEAR

1. Course from Group I.
2. Course in a subject previously taken but not covered by the later courses in Science.
3. Mathematics I, II., and III.
4. Surveying I.
5. Drawing I.
6. Projection I.

The degree of B. A. will be conferred on candidates who complete four years' work with a minimum standing of fifty per cent. and sixty-two per cent. in half their classes.

FOURTH, FIFTH, AND SIXTH YEARS.

The fourth, fifth, and sixth years are the same as the second, third, and fourth years of the B.Sc. Courses.

If a student on one of these courses wishes to specialize in one or more of the Arts subjects, he may do so in the honour classes.

Attention is called to the fact that by proper selection of classes an entire Arts course leading to the degree M.A. and a B.Sc. course in the Faculty of Applied Science can be completed in seven years.

**Students registering on the combined B.A., B.Sc. Course who are eligible for allowance on Upper School certificates will be granted standing in Physics and Chemistry subject to the following regulations:*

(a) *If their standing on Honour Matriculation is Class I they may proceed without conditions.*

(b) *If their standing on Honour Matriculation is Class II they must pass the final examination in the corresponding course at the University, and unless they can present evidence of having satisfactorily completed laboratory work in connection with the course they must repeat the laboratory work at the University in whole or part as the department concerned may decide.*

(c) *If their standing on Honour Matriculation is Class III or Credit they must repeat in full the corresponding course at the University.*

SUBJECTS OF STUDY

ENGLISH

LECTURERS—C. J. VINCENT, A.M., Ph.D.
W. ANGUS, A.M., Ph.D.

FIRST YEAR ENGLISH

This course consists of the writing of weekly compositions and the study of prescribed works by the following authors: Hardy, Huxley, Butler, Conrad, Hudson, Wells, Galsworthy, Shaw, Maugham, etc.

Foerster and Steadman, *Writing and Thinking,* (Boston: Houghton Mifflin Company).

Lectures—Sections 1-4. *Monday* and *Wednesday* 8-9.
Sections 5-8, *Monday* and *Wednesday* 1-2.

GERMAN

PROFESSOR—HEINRICH HENEL, Ph.D.

LECTURER—S. M. GILMOUR, Ph.D.

GERMAN A.—PREPARATORY COURSE.

For third year students in Courses B. and H. and fourth year students in Course C.

This course is intended to meet the needs of students who enter the University with little or no knowledge of German. It is taken by students who need it to complete their Matriculation, or who desire to pursue a course in which German text-books or works of reference are prescribed or recommended. The requirements correspond in a general way to those for Junior Matriculation. The course will count towards a degree.

Text-books:

Fotos & Bray—*German Grammar for Chemists and Other Science Students* (Wiley).

Fiedler & Sandbach—*A First German Course for Science Students*—(Oxford).

Nock—*An Introduction to Scientific German*—(MacMillan).

Lectures—Monday, Wednesday and Friday at 4.

Dr. Gilmour.

SCIENTIFIC GERMAN

For fourth year students in Courses B. and H. or any Science students.

This course is designed for students who are doing advanced work in chemistry, physics, geology and mineralogy. The work consists of a more advanced study of German grammar and syntax, and reading of scientific texts selected to suit members of the class. Prerequisite: German A, or Matriculation in German.

Text-books:

Curts—*Einführung in die Chemie.* (Holt).

Curts—*Readings in Scientific and Technical German.* (Holt).

Scientific Journals bearing on each student's special field.

Students are advised to purchase also:

Patterson, *German-English Dictionary for Chemists.* (Wiley.)

Lectures—Tuesday and *Thursday at* 9.

Dr. Gilmour.

FRENCH

FRENCH I.

For prescription, hours and instructors, see the Arts Calendar.

ECONOMICS

PROFESSOR OF COMMERCE—C. E. Walker, B.Sc. (Acc.), C.A.

ECONOMICS I.

Required of Fourth Year Students in all courses.

A study of the economic and business problems of the engineer with regard to the organization, financing and management of engineering enterprises. The course includes a discussion of the law pertaining to general contracts, agency and the sale of goods. Attention is also given to the nature and purpose of accounting and cost records. The results shown by these records are analysed and interpreted to show the extent to which they may be used as an aid to management.

Some of the general principles of industrial management also are discussed, the discussion being under the direction of Mr. J. C. Cameron, Head of the Department of Industrial Relations.

Assigned Readings.

Lectures—Monday and Wednesday at 9. *Thursday at* 8.

BIOLOGY

ASSOCIATE PROFESSOR—JOHN STANLEY, M.A., Ph.D.

BIOLOGY XVa—GENERAL ZOOLOGY

For third year students in course C, first term.

Lectures on the classification, comparative anatomy, physiology, development, evolution, distribution and economic importance of animals from the Protozoa to the Insects. Students taking Geology may make arrangements to obtain information regarding groups of animals of interest to a Geologist or a Paleontologist.

Text Book—Hegner, *College Zoology,* 4th. ed. (MacMillan)

Lectures—Tuesday and Thursday at 10, first term.

Professor Stanley.

MATHEMATICS.

PROFESSOR—J. Matheson, M.A.

PROFESSOR—C. F. Gummer, M.A., Ph.D.

PROFESSOR—N. Miller, M.A., Ph.D.

ASSOCIATE PROFESSOR—K. P. Johnston, B.A., B.Sc.

ASSISTANT PROFESSOR—G. L. Edgett, M.A., Ph.D.

LECTURERS—J. O. Watts, M.A., J. D. Stewart, M.A.

An essential part of the student's training in all courses in Mathematics is the training in accurate computation. He should cultivate the habit of care and accuracy in all his numerical work.

MATHEMATICS I

For first year students in all courses.

TRIGONOMETRY, to cover spherical trigonometry and a review of the more important parts of plane trigonometry.

Sections 1-4, *Tuesday* and *Thursday* 2-3.

Sections 5-8, *Tuesday* and *Thursday* 9-10.

Mr. Watts and Mr. Stewart.

MATHEMATICS II

For first year students in all courses.

CALCULUS. A course covering differentiation and the simpler methods of integration with applications to rates, maxima and minima and the finding of areas, volumes, surfaces, fluid pressure, centres of gravity, moments of inertia, etc.

Text Book—Phillips, *Calculus* (John Wiley & Sons).

Sections 1-4, *Tuesday* and *Thursday* 1-2.

Sections 5-8, *Tuesday* and *Thursday* 10-11.

Professor Miller, Mr. Watts, and Mr. Stewart.

MATHEMATICS III

For first year students in all courses.

ANALYTIC GEOMETRY. A review of the geometry of the straight line and circle, and a study of the conics and other plane curves of importance in engineering.

Text Book—Tanner and Allen, *Brief Course in Analytic Geometry*, (American Book Company).

Sections 1-2, *Wednesday* 10-11, *Friday* 8-9.

Sections 3-4, *Monday* 3-4, *Wednesday* 10-11.

Sections 5-8, *Wednesday* 3-4, *Friday* 1-2.

Professor Gummer, and Mr. Stewart.

MATHEMATICS IV.

For first year students in all courses.

SYNTHETIC SOLID GEOMETRY, covering the properties of the principal solid figures, methods and formulae for areas and volumes, etc.

ASTRONOMY, including the fundamental principles of the subject, such as the systems of co-ordinates, planetary motion, time, the use of the Nautical Almanac.

Sections 1-4, *Monday* and *Friday* 10-11.

Sections 5-8, *Monday* and *Friday* 3-4.

Professor Johnston and Professor Edgett.

MATHEMATICS V.

For second year students in all courses.

CALCULUS AND ALGEBRA. This course continues the Calculus of Mathematics II., and covers certain important parts of Algebra. It includes such topics as curvature, convergence of series, Taylor's series with applications, determinants, partial fractions, solution of numerical equations, integration of more difficult forms with applications and simple differential equations.

Text Book:—Phillips, *Calculus* (John Wiley and Sons).

A.B.C.D.M. Sections 1 and 2—*Monday and Friday* 10-11, *Wednesday* 1-2.

A.B.C.D.M. Sections 3 and 4—*Monday, Wednesday and Friday* 11-12.

E.F.G.—*Monday, Wednesday and Friday* 11-12.

Professor Johnston, Professor Edgett, and Mr. Watts.

MATHEMATICS VI.

For third year students in courses F. and H.

A continuation of Mathematics V to cover certain topics in analytic solid geometry and in addition, partial differentiation, maxima and minima for functions of several variables, double and triple integration and simple differential equations with applications.

Text Book: Phillips, *Calculus* (John Wiley and Sons).

Wednesday and Friday, 10-11, first term.

Professor Miller.

MATHEMATICS VII.

For third year students in course G.

Mathematics VI and a continuation to include such topics as hyperbolic functions, the catenary, a more detailed study of differential equations, introduction to Fourier series and the use of the complex variable.

Text Book:—Miller, *First Course in Differential Equations* (Oxford University Press).

Wednesday and Friday, 10-11.

Professor Miller.

MATHEMATICS X.

For fourth year students in course H.

A course in Analytic Solid Geometry involving a study of various solid figures and of the general properties of surfaces. Introduction to Differential Geometry.

Text Book: Snyder and Sisam, *Analytical Geometry of Space* (Holt).

Monday, Wednesday and Friday, 8-9, second term.

Professor Gummer.

MATHEMATICS XI.

For third year students in course H.

A course in Differential Equations to include the more important methods of solution of ordinary differential equations, and a brief introduction to partial differential equations.

Text Book: Miller, *First Course in Differential Equations* (Oxford University Press).

Tuesday, Thursday and Saturday, 8-9, second term.

Professor Miller.

ASTRONOMY II.

For second year students in courses E. F. and G.

Applications of Spherical Trigonometry to Geodesy and Astronomy. The method of least squares.

Saturday, 11-12. Professor Johnston.

PHYSICS

Professor—A. L. Clark, B.Sc., Ph.D., F.R.S.C.

The Chown Research Professor—J. A. Gray, B.Sc., D.Sc., O.B.E., F.R.S., F.R.S.C.

The Robert Waddell Professor of Experimental Physics—J. K. Robertson, M.A., F.R.S.C.

Professor—E. Flammer, B.Sc., Ph.D.

Assistant Professors—H. M. Cave, M.A., Ph.D.; B. W. Sargent, M.A., Ph.D.; E. E. Watson, M.Sc., Ph.D.; H. W. Harkness, M.Sc., M.A., Ph.D.

Demonstrators—J. E. Kennedy, B.A.; C. M. Cross, B.A.

The work in Physics is carried on in lecture and laboratory courses which run parallel to each other. In the lecture room the fundamental principles are developed and applied, experimental demonstrations given and many problems solved. In all classes in Physics weekly exercises are required of students. In the laboratory a large number of experiments are performed. These are designed to train the student in manipulation of apparatus and instruments of precision, to teach him to make accurate measurements and to give practice in properly recording, interpreting and reducing experimental data.

In all the courses in Physics, the work in the laboratories will be counted as a certain percentage of the whole work of the session. In estimating the standing in the laboratory work, both the quantity and quality of the work done will be considered.

Physics I. and II., together forming a complete introductory course, are taken by all first year students. Previous knowledge, though valuable, is not required. The laboratory work of this year is arranged to supplement the lectures in both Physics I. and II., and credit for this work is given on the written papers in both subjects. Students in both classes have opportunity for assistance by Douglas Tutors. (See page 33).

PHYSICS I.

Required of all first year students.

The subjects dealt with include the elementary treatment of uniformly accelerated motion, Newton's Laws and their application as the basis of Mechanics, Vector addition applied to simple cases of forces, velocities, momenta, etc., Work, Power, Moments, Simple cases of Centre of Mass and of Equilibrium, the application of mechanical ideas to the elementary statics of liquids and gases.

Lectures—Sections 1-4, *Monday* 11-12, *Thursday* 3-4.
—Sections 5-8, *Monday* 4-5, *Thursday* 8-9.

Professor Watson and Dr. Harkness.

PHYSICS II.

Required of all first year students.

A course of lectures of two hours per week on Magnetism, Electricity, Wave Motion, Sound, Light and Heat. These topics are discussed mathematically and illustrated by experiments.

Lectures—Sections 1-4, *Wednesday* and *Friday* at 11.
Sections 5-8, *Wednesday* 4-5, *Friday* 2-3.
Professors Robertson and Cave.

Laboratory—Section 1, *Monday*, 1-3, Section 2, *Monday*, 3-5.

Section 3, *Thursday* 8-10, Section 4, *Thursday* 10-12.

Section 5, *Monday* 8-10, Section 6, *Monday* 10-12.

Section 7, *Thursday* 1-3, Section 8, *Thursday* 3-5.

PHYSICS III.

This class required of students in the second year in courses E. F. G.

This course of lectures is a continuation of Physics I. Mathematics V is taken at the same time as this class, consequently during the latter part of the year the Calculus is used freely. A general review of the important fundamental principles of Physics occupies the first few weeks. These are then applied to problems dealing with Motion in a Circle, Simple Harmonic Motion, Composition of Simple Harmonic Motions with applications, Moments of Inertia, Rotation, Friction of Belts, Pivots and Bearings, Oscillations, Centre of Percussion, Elasticity in Stretching, Bending and Twisting, Energy and its Transformations.

The laboratory work, which runs parallel with the lectures, is a continuation of the work of the first year.

Lectures—Monday and *Friday*, 9-10.
Professor Harkness.

Laboratory—Sects. 1, 2, 3, *Friday*, 1-3 (a), *Thursday*, 3-5 (b); Sects. 4, 5, 6, *Wednesday*, 1-3 (a), *Thursday*, 1-3 (b).
Professors Sargent, Watson and Harkness.

PHYSICS IV.

This class which is required of students in the second year in Courses E, F, G, consists of (a) two lectures per week, (b) a laboratory course of two hours per week.

In the lectures, fundamental electrical ideas are discussed, with special emphasis on quantitative relations. Problems are assigned weekly dealing with basic ideas of Electrostatics, Magnetism, Electromagnetism, Electrodynamics, Electromagnetic Induction, and Alternating Currents.

The laboratory course includes a series of experiments designed to train the student in standard electrical measurements, as well as to illustrate work discussed in lectures.

Lectures—Wednesday, 9-10, *Friday*, 8-9. Professor Watson.

Laboratory—Sects. 1, 2, 3, *Thursday*, 3-5 (a); *Sects.* 4, 5, 6, *Thursday*, 1-3 (a); *Sects.* 1-2, *Monday*, 3-5 (b); *Sects.* 3-4, *Saturday*, 8-10 (b); *Sects.* 5-6, *Friday*, 1-3 (b).
Professors Sargent, Watson and Harkness.

PHYSICS XIV.

This class is required of students in the second year in courses A.B.C.D.M. There are three lectures per week in the first term and two in the second, four laboratory hours in the first term and two in the second.

The work comprises nearly all of the work of Physics III and parts of Physics IV. Approximately two-thirds of the time is given to Mechanics and one-third to Electricity and Magnetism.

Lectures—Secs. 1 and 2, *Tuesday* 8-9, *Thursday* 10-11; and *Saturday* 8-9 first term.

Secs. 3 and 4, *Tuesday* 10-11, *Thursday* 8-9, and *Monday* 10-11 first term.

Professors Flammer, Sargent, and Harkness.

Laboratory—Secs. 1, 2, *Monday* 3-5 (first term); *Tuesday* 3-5.

Secs. 3, 4, *Monday* 1-3 (first term); *Tuesday* 1-3.

Professors Sargent, Cave, and Harkness.

PHYSICS V.

Required of students in third year of Courses G. and H.

The work of this class comprises a course of lectures on the Elementary, Mathematical Theory of Electricity and Magnetism, and a course of laboratory experiments in advanced electrical measurement.

In the lectures are treated such topics as the more important laws and theories in Electrostatics, the laws of the Magnetic Field, Electrodynamics and Electromagnetic Induction. At each lecture problems are assigned for solution and these are later discussed in class.

In the laboratory the students make detailed study of several groups of experiments. These comprise careful study of galvanometers using both steady and transient currents, measurements of capacities, permeability, insulation resistance, and self and mutual induction, the use of the potentiometer in measurement of electro-motive force of cells, calibration of voltmeters and ammeters, and study of electrical waves and discharge phenomena.

Lecture—Thursday, 9-10, first term.

Thursday 4-5, second term.

Laboratory—Wednesday, 1-4.

Professor Flammer.

PHYSICS VI.

Elementary Theoretical Mechanics.

Required of students in third year of Course H.

This course consists of a series of lectures in which the elements of Statics and Dynamics of a Particle are discussed.

Lectures—Tuesday, Thursday and *Saturday,* 10-11, second term.

Laboratory—Monday, 1-3, second term.

Professors Flammer and Watson.

PHYSICS VII.

Required of students in third year of Course H.

HEAT. This part of the course is an introduction to Thermodynamics, beginning with a detailed discussion of the isothermal and the basis of thermometry and continuing with the development of the laws of Thermodynamics and a discussion of entropy, its properties and applications.

ELECTRICITY. The general aim of this part of the course is to acquaint the student with the modern developments in such branches of Physics as Radiation, X-rays, Conduction of Electricity through Gases, Radioactivity, etc.

Text Book—*Ions, Electrons and Ionizing Radiations,* by J. A. Crowther.

Lectures—Monday and Wednesday, 10-11; *and Friday,* 10-11, first term.

Laboratory—Thursday, 2-4 (a), 3-5 (b); *and Monday,* 1-3, second term.

Dean Clark, Professor Gray and Professor Cave.

PHYSICS IX.

Required of students in fourth year of Course H.

MECHANICS OF RIGID AND ELASTIC BODIES. This part of the course includes a discussion of such topics as the Motion of a Rigid Body, Ellipsoids of Inertia, Motion with Fixed Axis and Fixed Point, Euler's Equations, and applications to motion of the symmetrical top; Stress and Strain relations in Elastic Bodies, Elastic Constants.

ELECTRICITY. The lectures in this part of the course are on advanced Electrodynamics.

Monday, Wednesday and Friday, 11-12.

Professor Flammer

PHYSICS X.

Required of students in fourth year of Course H.

KINETIC THEORY OF GASES. This part of the course includes the topics of the Maxwellian distribution of velocities, free path phenomena, viscosity, thermal conductivity, diffusion, Van der Waal's equation, and the quantum theory as applied to specific heats and to radiation.

PHYSICAL OPTICS. The lectures in this part of the course are on the theory and phenomena of Physical Optics, including a discussion of Wave Motion, Diffraction, Interference Spectroscopes, Polarization and Double Refraction.

Text Book—*Kinetic Theory of Gases* by Bloch.

Lectures—Tuesday and Thursday, 11-12; *and Saturday,* 11-12, first term.

Laboratory—Thursday, 2-5, second term.

Professors Gray and Robertson.

PHYSICS XIII.

Required of fourth year students in Course H.

An advanced laboratory course of experiments in Optics, Electricity and Magnetism and Heat.

Monday and *Friday,* 1-4. Dean Clark and Professor Robertson.

PHYSICAL LABORATORIES.

The Physics Department is located in Ontario Hall, and contains two large lecture rooms, with seating capacities of 125, and 90 respectively, a small lecture room with seating capacity of 60, two small class rooms, three large rooms equipped as general elementary laboratories, and another room equipped for advanced work, offices for the staff, research rooms, a large, well-lighted library and reading room, smaller rooms for special purposes, apparatus and store rooms. The equipment for lecture table and laboratory is steadily growing and comprises most of the more important pieces of apparatus for these purposes.

Research in Physics is being carried on by members of the staff and by senior students. It is desired to extend this activity as far as possible. A limited number of workers who desire to use the facilities of the laboratory may be admitted and assisted. Particulars may be obtained from the Professor of Physics.

LIBRARY

The library contains text-books, works of reference, and journals devoted to Physics and related subjects. These may be freely consulted by the student in the reading room between the hours of 8 a.m. and 5 p.m. Books may in general be taken from the building overnight upon reporting to a member of the staff and making a record in a book provided for that purpose. It is only by special permission, however, that any book may be kept longer than one night at a time.

CHEMISTRY.

Professor of Chemistry—Arthur C. Neish, A.M., Ph.D., F.C.I.C.

Professor—J. A. McRae, M.A., Ph.D., F.I.C., F.R.S.C.

Associate Professor—Grenville B. Frost, B.A., Ph.D.

Associate Professor—L. A. Munro, M.A., Ph.D., F.C.I.C.

Assistant Professor—Roy L. Dorrance, M.A., F.C.I.C.

Lecturer—E. G. Taylor, B.Sc., Sc.M., Ph.D., A.I.C.

Instructor—J. A. Martin, M.A.

Arts Research Fellow—B. Van Order, B.A.

Milton Hersey Fellow—A. Abbott, B.Sc.

William Neish Fellow—J. A. Pearce, B.A.

Demonstrators—H. K. Coulthart, B.A.
A. K. Edwards, B.Sc.
J. Hanna, B.A.

	First Courses.	Second or Advanced Courses.	Research Training Courses.
General Chemistry	I	II, III	IV
Qualitative Analysis	I	———	—
Organic Chemistry	I, V	II	IV
Quantitative Analysis	I, II	———	IV
Physical Chemistry	I	II, III	IV
Industrial Chemistry	I, II	IIIa	IV
Colloid Chemistry	Ia	II	IV

General and Inorganic Chemistry

General Chemistry I.

For all first year students in Science.

This course presupposes a mastery of the contents of matriculation chemistry.

In addition to studying in detail the history, methods of preparation, properties and industrial applications of the most important non-metals and metals and their compounds, the fundamental theories, laws and principles are emphasized. Simple unknowns are also given.

Texts—*Kendall, Smith's Inorganic Chemistry,* (Century Co.).
Properties and Numerical Relationship of the Common Elements and Compounds—J. E. Belcher and J. C. Colbert. (Century Co.)

Lectures—Monday, Wednesday, Friday at 9, or *Monday and Wednesday* at 2 and *Friday* at 11, in room 310, Gordon Hall.

Laboratory—Sections 5-8, *Tuesday,* 1-4, *Sections* 1-4, *Wednesday* 1-4 in 305, 308, 301 Gordon Hall.

Professor Neish and Assistants.

General Chemistry II.

For students in Courses EFG Second Year.

This lecture course is designed to supplement Chemistry I, including in its scope such chemical principles, facts and theories as will find application in Civil, Mechanical and Electrical Engineering. Some of the topics dealt with are the chemistry of the metals, fundamental chemical theory, the laws of solutions, homogeneous and heterogeneous equilibria, the colloidal state and simple organic compounds. These topics are illustrated by lecture experiments and problems.

Texts—Kendall, *Smith's College Chemistry,* (Century Co.)

Chapin—*"Second Year College Chemistry"* (Wiley & Sons).

Lectures—Thursday 8-9, and *Saturday* 10-11.

Professor Munro.

General Chemistry III.

Advanced Inorganic Chemistry.

For students in Course B, third year.

A study of inorganic chemistry based on the modern form of the periodic system and the electronic theory of valency.

Text—To be announced at opening of term.

Lecture—Tuesday and *Thursday,* 11-12, first term.
Monday, 10-11, *Thursday,* 11-12, second term.

Dr. Taylor

General and Inorganic Chemistry IV.

Research Training.

For graduate students and students in Course B, fourth year, electing thesis option in General and Inorganic Chemistry.

Professors Neish, Frost and Munro

Qualitative Analysis.

Qualitative Analysis I.

For students in Courses A, B, C, D, M, second year.

The lectures deal with the theory of analytical chemistry. The modern concept of the structure of matter is related to analytical behaviour. The development and application of the laws of equilibrium and solutions are emphasized.

The laboratory work consists of the systematic analysis of basic and acid ions leading to the analysis of alloys, salt mixtures, minerals and various commercial products.

Texts—Miller, *Theory of Qualitative Analysis,* (Century Co.).

A. A. Noyes, *Qualitative Chemical Analysis,* 9th *Edition,* (Macmillan).

Reference Texts—Stieglitz, *Qualitative Analysis Vol I.,* (Century Co.).
Ware, *Essentials of Qualitative Analysis,* (Wiley).
Treadwell & Hall, Vol. I., (Wiley).
Curtman, *Qualitative Chemical Analysis,* (Macmillan).

Lectures—Tuesday and Thursday, 11-12, rooms 310 and 305, Gordon Hall.

Laboratory—Secs. 1, 2, *Thursday* 1-4 and *Saturday* 9-12;
Secs. 3, 4, *Wednesday* 8-11 and *Friday* 1-4.

Professor Munro.

Organic Chemistry I.

For students in Courses B and D, third year.

An introductory course into the chemistry of the compounds of carbon. The principal classes of aliphatic and aromatic compounds are studied to illustrate both their theoretical and practical importance. In the laboratory a number of typical aliphatic and aromatic compounds are prepared to illustrate typical operations employed in organic chemistry.

Texts—Conant, *The Chemistry of Organic Compounds* (Macmillan & Co.)

Adams and Johnson, *Laboratory Experiments in Organic Chemistry* (Macmillan & Co.)

Lectures—Wednesday and Friday, at 11 in room 310 Gordon Hall (Wednesdays) and in Nicol Hall (Fridays).

Laboratory—B students, *Saturday,* 9-12 in rooms 213 and 201, Gordon Hall.
D students, *Wednesday,* 1-4, first term, and *Saturday,* 9-12, in the second term.

Professor McRae.

Organic Chemistry V.

For students in Course M, third year.

An introductory course in Organic Chemistry for students in Metallurgy.

Text-book—Conant, *Organic Chemistry* (Macmillan & Co.).

Lecture—Friday 9-10.

Professor McRae.

Organic Chemistry II.

Advanced Organic Chemistry.

For students in Course B, fourth year.

The principal reactions used in synthetic organic chemistry with practical illustrations in the laboratory. The more detailed chemistry of the aliphatic and aromatic series and of the simpler types of heterocylic compounds. Laboratory practice in qualitative and quantitative organic chemistry.

Texts—Kipping and Kipping, *Perkin and Kipping's Organic Chemistry,* Part III.

Conant—*The Chemistry of Organic Compounds,* (Macmillan & Co.)

Gattermann-Wieland, *Laboratory Methods of Organic Chemistry,* (Macmillan & Co.)

Books of Reference—Cohen, *Advanced Organic Chemistry,* (Arnold).
Francis, *Notes on Organic Chemistry* (Arnold).

Hickinbottom, *Reactions of Organic Compounds* (Longmans, Green and Co.).

Lectures—Tuesday and Thursday, at 11, in room 105, Gordon Hall,

Laboratory—Wednesday, 1-4; *Saturday,* 9-12, in room 213, Gordon Hall.

Professor McRae.

Organic Chemistry IV.

Research Training.

For graduate students and students in Course B, fourth year, electing thesis option in Organic Chemistry. Professor McRae

Quantitative Analysis I.

Short course.

For students in Courses A, C, D and M, third year.

This is an elementary course designed to illustrate the fundamental procedures of Quantitative Analysis. Gravimetric determinations are made of sulphur, chlorine and iron. A full treatment of volumetric analysis is given including acidimentry and oxidation-reduction methods. The determinations include iron and manganese in simple ores, iodimetric copper and other similar determinations.

Text—Talbot, *Quantitative Chemical Analysis.*

Lectures—A and C, *Thursday* 1-2, D and M, *Wednesday* 10-11, in room 105, Gordon Hall.

Laboratory—*Thursday*, 2-5, for A, Sec. 5 and 6, C, and D; *Friday*, 1-4, for M. *Tuesday* 1-4, Sec. 1 and 2 of A. *Saturday* 8-11, Sec. 3 and 4 of A.

Professor Dorrance and Mr. Martin.

Quantitative Analysis II.

Full course.

For students in Course B, third year.

This course is designed to give training in the principles and practice of Quantitative Analysis to students specializing in Chemistry. In the lectures methods of analysis are discussed showing the relation of the principles of theoretical chemistry to analytical problems. In the laboratory the volumetric work includes neutralization, oxidation-reduction and precipitation reactions, determinations being made of soda ash, iron ores, paris green, copper ores, proteins, oxalates, vinegars, zinc ores and silver salts. The gravimetric work includes the analysis of chlorides, sulphates, limestone; nickel, zinc and lead ores; alloys, steels and industrial products. A number of problems are assigned to illustrate the topics discussed in the lectures and to supplement the laboratory analysis. Throughout the course the accuracy and limitations of the methods are emphasized.

Text—Talbot, *Quantitative Analysis.*

Lectures—Monday and Wednesday, at 9, in room 105, Gordon Hall.

Laboratory—Wednesday, 1-4 and *Thursday* 2-5 and *Tuesday,* 1-5, second term in 207, 209, Gordon Hall. Professor Dorrance and Mr. Martin.

Quantitative Analysis IV.

Research Training.

For graduate students and students in Course B, fourth year, electing thesis option in Quantitative Analysis.

Professors Frost and Dorrance.

Physical Chemistry.

Physical Chemistry I.

For students in Courses B, C, D, M, third year.

This course is designed to serve as an introduction to the principles of theoretical chemistry both for students proceeding to more advanced work and for those who desire to obtain some knowledge of the subject in view of its application in other fields. Phenomena involving gases, liquids and solutions are approached from the standpoint of the simple kinetic theory. A few lectures on the crystalline state are included. The phase rule and its applications to systems of two and three components is considered thoroughly. The elementary principles of thermo-chemistry, equilibria and kinetics are also studied. A large number of problems are assigned.

Lectures—Tuesday and Thursday, at 9, in room 105, Gordon Hall.

Laboratory—Friday, 1-4 for B, *Tuesday,* 1-4 for C, in 115, 116 Gordon Hall.

Students in courses D and M will take physical chemical laboratory in the Chemical Engineering Department, under Dr. L. F. Goodwin.

Tuesday, 1-4, D, M, Sect. 1; *Wednesday,* 1-4, M (a), Sect. 2; *Saturday,* 9-12, M (b), Sect. 2.

Professor Frost.

Physical Chemistry II.

Electrochemistry.

For students in Courses B, D, M, fourth year.

This course is designed to acquaint the student with the application of electricity to aqueous solutions considering such quantities as the mechanism of electrolysis, transport numbers and ionic migration, solvation of ions, conductance of solutions, modern dissociation theory, reversible cells with and without diffusion, hydrogen electrode, polarization, overvoltage, anodic and cathodic reactions. Some industrial applications such as storage batteries, electrolysis of fused salts, electroplating are discussed. The laboratory work consists in the determination of the quantities discussed in the lectures, electrometric titrations, and the production, electrolytically, of such compounds as ammonium persulphate and white lead.

Prerequisite—Chemistry 1, 2, 12, 13, 14.

Texts—Creighton, *Electrochemistry* (Vol. I), (John Wiley).
Findlay, *Practical Physical Chemistry,* (Longmans, Green & Company).

Reference—Kolthoff and Furman, *Potentiometric Titrations,* (John Wiley).

Lectures—Monday at 10, and *Tuesday* at 8.

Laboratory—M *Wednesday* 1-4; B and D *Thursday* 2-5.

Professor Dorrance.

Physical Chemistry III.

Advanced Physical Chemistry.

For students in Course B, fourth year.

This course is designed to give a thorough training in the principles of chemical thermodynamics and their application to chemical problems. Practice is given in the computation of free energies, activities and entropies of substances.

Lectures—Tuesday and Thursday, at 10, in 105 Gordon Hall.

Laboratory—Friday, 1-4, in 116 Gordon Hall.

Professor Frost.

Physical Chemistry IV.

Research Training.

For graduate students and students in Course B, fourth year, electing thesis option in Physical Chemistry.

Professors Frost, Dorrance and Munro

Industrial Chemistry

Industrial Chemistry I.

Short course.

For students in Course E, fourth year.

For outline of topics see under Department of Chemical Engineering.

Industrial Chemistry II.

Long course.

For students in courses B and D, third year.

D students, third year, see under Department of Chemical Engineering.

In the lectures the following topics, illustrated by specimens, lantern slides and motion pictures and visits to plants, will be discussed: Industrial applications of air and water, natural gases, petroleum products, producer gas, water gas, coal gas, by-product coke, sulphur, sulphuric acid (chamber and contact), sulphites, hydrochloric acid, nitric acid and ammonia, nitrates

(natural and synthetic,) fertilizers, alkalies, mortars, and cements. In the laboratory typical industrial processes as crystallization, precipitation, filtration, distillation and rectifications, incomplete reactions, gas analysis, industrial flow sheets will be carried out and interpreted.

Text—Rogers, *Manual of Industrial Chemistry* (Van Nostrand).

Handbooks—Atack, *Chemists' Year Book* (Westman Press) or
Chemical Rubber Pub. Co., *Handbook of Chemistry and Physics* or
Lang's *Handbook of Chemistry* or
Olsen, *Chemical Annual* (Van Nostrand) or
Perry, *Chemical Engineers Handbook* (McGraw-Hill).

Lectures—Tuesday and Thursday at 10, B in room 310, Gordon Hall.

Laboratory—B, Monday 1-4, in 500, Gordon Hall.
D students see under Dept. of Chemical Engineering.

Professor Neish.

Industrial Chemistry IIIa.

Advanced.

For students in Course B, fourth year—first term.

For outline of topics see under Department of Chemical Engineering.

Lectures—Wednesday and *Friday*, at 11, first term, in Ontario Hall.

Laboratory—Monday, 1-4, first term, in Ontario Hall.

Professor Goodwin.

Industrial Chemistry IV.

Research Training.

For graduate students and students in Course B, fourth year, electing thesis option in Industrial Chemistry.

Professor Neish.

Colloid Chemistry Ia

For students in Course D, fourth year, first term. A short introductory course in Colloid Chemistry. The lectures deal with the general properties of the colloidal state, particle size and sedimentation analysis, dialysis, ultrafiltration and electrokinetic phenomena.

The laboratory work illustrates and supplements the material dealt with in lectures.

Text books:

Thomas, *Colloid Chemistry* (McGraw-Hill).

Lectures—Wednesday at 10, first term.

Laboratory—Tuesday 1-3, first term.

Professor Munro

Colloid Chemistry II

For students in Course B, fourth year.

A course in Surface Chemistry treating the general properties of the colloidal state and heteroteneous catalysis. The lectures deal with the following topics: the colloidal state, particle size and sedimentation, dialysis, Donnan equilibrium, ultrafiltration, electrokinetic phenomena, surface energy, interfacial tensions, flocculation and protective action, emulsions, foams, gels, plastics, sorption, the mechanism of catalysts, activation, promotors, carriers, retarders, mixed catalysts and heterogeneous chain reactions.

The laboratory work illustrates the topics dealt with in lectures.

Texts—

Thomas, *Colloid Chemistry* (McGraw-Hill).

Griffith, *The Mechanism of Contact Catalysis* (Oxford University Press).

Reference texts—

Weiser, *Inorganic Colloid Chemistry* (Wiley and Sons).

Heuser, *Colloidal Phenomena* (McGraw-Hill).

McBain, *The Sorption of Gases by Solids* (Routledge Co.).

Maxted, *Catalysis and its Industrial Applications* (Churchill).

Schwab-Taylor, *Catalysis* (Van Nostrand).

Lectures—First term, *Wednesday* and *Friday* at 10 a.m.
Second term, *Wednesday* and *Friday* at 11 a.m.

Laboratory—*Tuesday* 1-3 p.m., first term only.

Professor Munro

GEOLOGY

Professor—M. B. Baker, B.A., B.Sc., F.G.S.A., F.R.S.C.

Miller Memorial Research Professor—
E. L. Bruce, B.Sc., M.A., Ph.D., F.R.S.C., F.G.S.A.

Professor—B. Rose, B.Sc., Ph.D., F.G.S.A., F.R.S.C.

Lecturer—Newton W. Buerger, S.M.

Assistants—W. C. Güssow, M.Sc., Ph.D.; H. F. Morrow, B.Sc.

Research Assistant—W. T. Love, B.Sc.

The Geological and Mineralogical Museum, situated on the ground floor of Miller Hall, is equipped with splendid collections of minerals, ores, rocks and fossils, classified and systematically arranged to illustrate most of the subjects treated in lectures. This is a section of the work in which the co-operation of the mining public is invited, and all donations to this museum will be kept and credited to the donor.

The various courses in Geology, described in some detail below, are intended to equip the professional geologist, the mining engineer, the civil engineer requiring a knowledge of the relative merits of natural construction material.

GEOLOGY I.

For second year students in courses A, B, C, D, M.

ELEMENTARY GEOLOGY. Students taking this class must have passed in Chemistry I.

An introductory course in general Geology is given preparatory for those students who proceed to a more advanced course in Geology or Mining, and at the same time a more or less complete, though elementary course for those who do not pursue the subject any farther.

During the month of October excursions will be conducted to places of geological interest in the vicinity of Kingston. Students in Geology and Mineralogy are required to take part in these excursions.

Text-book: Miller, *Elements of Geology,* (Van Nostrand Co.).

Lectures—Tuesday and Thursday, 9-10. Professor M. B. Baker.

GEOLOGY II.

For third year students in course C.

STRUCTURAL, DYNAMICAL, AND PHYSIOGRAPHICAL GEOLOGY. Before taking this class students must have passed in Geology I.

The principles of gradation, deformation, faulting, mountain formation, and vulcanism are covered in a more general and a more advanced way than in Geology I. Attention is also given to the origin of the earth; the metamorphic cycle; types of marine and continental sedimentation; an introduction to paleontology, physiography, map reading and interpretation.

Text-books: Nevin, *Structural Geology.*
Platt, *Geological Map Exercises.*

Lectures—Wednesday and *Friday,* 9-10. Professor Rose.

Laboratory—Monday, 8-10.

GEOLOGY III. (b)

For students in Courses A and C, third year.

ELEMENTARY PETROGRAPHY. Students must have passed in Geology I.

This course is essentially on igneous geology and petrography, and on the determination of some of the more common igneous rocks by both microscopic and field tests. The lectures will be supplemented by laboratory work on hand specimens and rock slices.

Text-book—Pirsson, *Rocks and Rock Minerals* (John Wiley & Sons).

Lectures—Thursday 10-11, and *Friday* 11-12, second term.
Mr. Buerger.

Laboratory—Second term. Course A, Sections 1 and 2, *Friday* 3-5; Sections 3 and 4, *Friday* 1-3; Sections 5 and 6, *Wednesday* 1-3. Course C. *Wednesday* 1-3.
Professor Baker, and Mr. Buerger.

GEOLOGY IV.

For third year students in Course A.

STRUCTURAL GEOLOGY—Students must have passed in Geology I.

Imposed structures in sedimentary, igneous, and metamorphic rocks, with particular attention to faulting, folding, and shearing. Illustrated mainly from Canadian occurrences where possible.

Text-book—Nevin, *Structural Geology.*

Lecture—Friday 11-12, first term and *Tuesday* 10-11, second term.

Professor Rose.

GEOLOGY V.

For fourth year students in Courses A. and C.

GEOLOGY OF CANADA. Before taking this class, students must have passed in Geology I. and IIIb.

In this course special attention will be given to Pre-Cambrian Geology, and the distribution of the various rock formations in Canada. The topography as well as the structural make-up of the Dominion is studied.

Lecture—Monday, 10-11. Professor Bruce.

GEOLOGY VI.

For fourth year students in Course C.

HISTORICAL GEOLOGY. After a brief study of the various types of sedimentary formations and the principles of paleogeography, the history of the North American continent is taken up with supplementary references to the other continents when desirable. Emphasis is laid on Canadian occurrences. A number of the more important fossils of each period are studied, and their recognition on sight required. Brief consideration is also given to the history of the Science of Geology.

Text-book—Pirsson and Schuchert, *Text-book of Geology Part II.* (Historical), (John Wiley & Sons.)

Lectures—Tuesday and Thursday, 9-10. Professor Rose.

GEOLOGY VII.

For third year students in Course C.

ADVANCED PETROGRAPHY. A laboratory class in which a more intensive study is made on the petrographic features of igneous, sedimentary and metamorphic rocks than was possible in Geology III.

Laboratory—Thursday, 2-4, second term. Mr. Buerger

GEOLOGY VIII.

For fourth year students in Courses A and C.

ECONOMIC GEOLOGY. This class treats of the principles of ore deposition. The basis of classification and the fundamental principles underlying economic deposits are studied with particular reference to iron, copper, nickel, zinc,

lead, silver, gold, aluminum, peat, coal, gas, oil, salt, abrasive and refractory materials. A few lectures on building stones as well as on clays and the manufacture of clay products will be given.

Lectures—Tuesday, 11-12, and *Thursday,* 1-2.

Professor Baker.

GEOLOGY IX.

For third year students in Course E.

Engineering Geology. This course is intended for students in Civil Engineering, and after a brief introduction to geology will treat of the occurrence, composition, texture, structure and alterations of rocks, with special reference to their effects on the workability or removal of the rocks in excavation, and in the selection of raw material in construction work. There will also be lectures on clay-products and the selection of building materials, and an outline of the manufacture of bricks, fire-proof blocks, terra-cotta, roofing-tile, sewer-pipe, and drainage-tile, will be given. Physiography and drainage will also be studied, and a brief discussion of the principles of economic geology.

Text-book—Ries & Watson, *Elements of Engineering Geology,* (John Wiley & Sons).

Lectures—Wednesday and Thursday, 11-12. Professor Baker.

GEOLOGY X.

For third year students in Course C.

Field and Laboratory Geology. The laboratory exercises in this course are designed to illustrate by means of specimens, models, photographs, maps and sections, the principal original and secondary structures of rocks; and their interpretation and representation in geological surveys.

The field work comprises practice in methods of surveying and geological mapping and construction of sections; measuring the thickness of strata and determining the relative ages of geological structures, and the preparation of a map to scale.

Four working hours per week will be arranged to suit the class at the beginning of the first term.

Field Work—Monday, 1-5. Professor Rose.

GEOLOGY XII.

For fourth year students in course C.

A course of lectures will be given on classification of igneous rocks, their mode of occurrence, and their field characters.

Text-book—Harker, *Petrology for Students.* (Cambridge Press).

Lectures—Wednesday and *Friday,* 10-11, first term.

Mr. Buerger.

Reports

For fourth year students in Course C.

Weekly reports or essays based on field trips, summer work, or on topics of a mineralogical or geological nature as prescribed by the departments of Geology and Mineralogy will be required. These are intended to test the students' ability to read up a subject, and then to summarize it in presentable form for publication. The class will be conducted by the department of Geology for the first term, and by the department of Mineralogy for the second term.

GRADUATE COURSES

For graduates in Courses A (Geology option) and C.

GEOLOGY XIII.

Principles of Pre-Cambrian Geology. The origin, history and distribution of the rocks older than the Cambrian. Special attention will be given to the Canadian Pre-Cambrian areas. The course will be given in alternate years. It will be offered in 1939-40.

Lectures—Wednesday and Friday at 9.

Reading and Laboratory Work—Wednesday, 1-4. Professor Bruce.

GEOLOGY XIV.

Metamorphic and Structural Geology. The processes of rock weathering, consolidation of sediments, formation of gneiss, and the wall rock alterations produced by veins are studied in detail. The principles of rock deformation are discussed. The course will be offered in alternate years. It will not be offered in 1939-40.

Lectures—Tuesday and Thursday at 9.

Reading and Laboratory Work—Thursday, 1-4. Professor Bruce.

GEOLOGY XV.

Pre-Cambrian Ore Deposits. Discussion of ore deposits in Pre-Cambrian rocks with especial reference to those in Canada. The genesis and character of the deposits will be studied in detail. It will be offered in 1939-40.

Text Book: Bruce, *Mineral Deposits of the Canadian Shield,* (The MacMillan Co.).

Lectures—Tuesday and *Thursday,* 9.

Reading and Laboratory Work—Thursday, 1-4. Professor Bruce.
Excursions to accessible localities are required.

Seminar—A Seminar for students in graduate courses meets two evenings each month. It is voluntary and no registration is required.

MINERALOGY

PROFESSOR—J. E. Hawley, M.A., Ph.D., F.G.S.A., F.R.S.C.
LECTURER—N. W. Buerger, S.M.
ASSISTANT—W. J. McGill, B.Sc.

The work in this department is intended for students taking the courses in (1) Mining and Metallurgical Engineering, (2) Chemistry, (3) Mineralogy and Geology, and (4) Chemical and Metallurgical Engineering.

MINERALOGY I.

For Second year students in Courses A, B, C, D, M.

ELEMENTARY MINERALOGY—Lectures cover (1) the physical properties and identification of the common rock and ore forming minerals, (2) The relation between Mineralogy and Geology, (3) The chemistry of minerals, (4) Crystallography, (5) World distribution of minerals which are of economic importance, (6) the detailed properties, occurrence and uses of about one hundred important minerals. In the laboratory practical work is given in crystallography and in the identification of minerals by physical tests and blowpipe methods.

Field trips during October and November are held in conjunction with the Department of Geology.

Each student is supplied for the session with a locked cabinet containing a collection of minerals for which he is held responsible. *A practical examination requiring the identification of minerals in hand specimens must be passed by each student before credit in this course will be given.* Students are urged to make use of the museum, and of the study room provided for them in the Mineralogy department.

Text-books: For Courses A, and C, Ford, *Dana's Text-book of Mineralogy* (Wiley and Sons, 1932). 4th Edition.

For Courses B. and D, choice of:

Ford, *Dana's Manual of Mineralogy,* 14th Edition, 1929.

Kraus, Hunt and Ramsdell, *Mineralogy* (McGraw Hill 1936).

Books of Reference:

Mineralogy—E. H. Kraus and W. F. Hunt, 3rd Edn. (McGraw Hill 1936).

Study of Minerals and Rocks—H. F. Rogers, 2nd Edn. (McGraw Hill 1924).

Brush & Penfield, *Manual of Determinative Mineralogy and Blowpipe Analysis,* 17th Ed., 1912 (Wiley & Sons).

Saturday Excursions.

Lectures—Monday at 9 first term; *Monday* and *Friday,* at 9 second term, Sections 1 and 2; *Friday* at 10 first term; *Friday* at 10, *Monday* at 2, second term, Sections 3 and 4.

Professor Hawley and Mr. Buerger.

Laboratory—Monday, 1-3, Sections 1 and 2; *Monday,* 3-5, Sections 3 and 4.

MINERALOGY II.

PHYSICAL MINERALOGY. For students in Course C. Third year, and Course A, Fourth year, Geology option.

The work consists of a course of lectures, dealing with crystallography, crystal measurements and drawing, and a more advanced study of the physical properties of minerals.

Text-books—Dana, *Text-book of Mineralogy,* 1932. (Wiley & Sons).
James, R. W., *X-Ray Crystallography* (Methuen), 1930.

Books of Reference:

Bragg, W. L., *Atomic Structure of Minerals* (Cornell Univ. Press), 1937.

Wyckoff, R. W. G., *The Structure of Crystals* (1931).

Bragg, *X-ray and Crystal Structure,* 4th Ed.

Lectures—Monday and *Wednesday,* 10-11, 2nd term. Mr. Buerger.

Laboratory—Saturday, 10-12, 2nd term.

MINERALOGY III.

For students in Courses B, and C, third year, and Course A, Fourth year. Geology option, first term.

OPTICAL MINERALOGY—The work of this class deals with the optical properties of nonopaque chemical substances and natural minerals. For chemistry students it serves as an accurate method of identifying both organic and inorganic solid chemical substances by their indices of refraction and other optical properties, provided these are known, as a method of proving homogeneity of fine chemical compounds, and as an introduction to microchemical methods of testing for minor constituents in inorganic compounds. For geology and mineralogy students it is preparatory to the classes of petrography and determinative mineralogy and deals with the optical properties of the common rock forming minerals.

Text-book:—Dana, *Text-book of Mineralogy*—4th ed., 1932. (Wiley and Sons), or *Elements of Optical Mineralogy* (Part I), A. N. Winchell, 3rd Ed., (Wiley and Sons), 1928.

Reference Books:—*Optic Properties of Crystals,* Groth and Jackson, (Wiley and Sons) 1910.

Crystals and the Polarising Microscope, Hartshorne and Stuart, (E. Arnold & Co.), 1934.

Thin Section Mineralogy, Rogers and Kerr, (McGraw Hill), 1933.

Lectures—Monday and Friday, 10-11, first term.

Laboratory—A—Geology Option—Tuesday 1-3, *B—Friday* 8-10, *C—Friday* 1-3, first term.

Professor Hawley and Assistants.

MINERALOGY IV.

For students in Courses A and C, Third year.

DESCRIPTIVE AND DETERMINATIVE MINERALOGY—ORE MINERALS. A course dealing with minerals which are important as ores of iron, manganese, chromium, tungsten, vanadium, tin, nickel, cobalt, gold, silver, copper, lead, zinc and aluminum. In the laboratory suites of ore minerals from various mining camps are examined by blowpipe methods and microscopically by polished sections. A brief survey is made of some important non-metallic minerals. Cabinets furnished with specimens of minerals from various parts of the world are supplied for students' use. Examination of a variety of mineral deposits in the vicinity of Kingston are made in October and November. Reports on these are required.

Text-books: Dana, *Text-book of Mineralogy,* 4th Ed. 1932. (Wiley and Sons).

Lindgren, *Mineral Deposits.* (McGraw Hill), 1933.

Reports on various deposits will be available in reading room.

Lectures: *Tuesday* and *Thursday* at 8.

Laboratory: *Wednesday* 1-3, Course A Sections 1, 2 and 3; *Wednesday* 3-5, Course C and Sections 4, 5 and 6 of A.

Professor Hawley and Mr. Buerger.

MINERALOGY V.

For students in Course C, Fourth year.

ADVANCED DESCRIPTIVE AND DETERMINATIVE MINERALOGY—NON-METALLIC MINERALS. A course dealing (1) with the identification of rock forming minerals by physical and optical properties; (2) the occurrence and utilization of non-metallic minerals used for Abrasives, Refractories, Ceramic Ware, Lime, Cements, Plaster, Fertilizers, Pigments, Insulators, Building Stone, Gems, etc.

Text-book: *Elements of Optical Mineralogy*—Part II, (Description of Minerals), A. N. Winchell, (Wiley and Sons).

Reference Books: *Publications of Geological Survey of Canada.*
Publications of Mines Branch, Dept. of Mines, Canada.
Publications of U.S. Geol. Survey.
Non-Metallic Minerals—Ladoo (McGraw-Hill, 1925).

Lectures: *Wednesday* and *Friday* at 11.

Laboratory: *Saturday,* 10-12. Professor Hawley.

MINERALOGY VI.

For students in Course C, A (Geology Option) and M, fourth year.

MINERALOGRAPHY—An advanced laboratory course in the study of metallic minerals in polished sections.

Text—Microscopic Determination of Ore Minerals, U.S.G.S. Bull. 825, M. N. Shortt.

Laboratory—Second term. *Tuesday* 1-4, Course M, *Thursday* 2-5, Course C, *Friday* 1-3, Course A (Geol. Opt.).

Lecture and Discussion—1 hour to be arranged.

Professor Hawley.

Research and Thesis—Students wishing to undertake the research work and thesis of the fourth year under the Department of Mineralogy should consult with the instructors not later than the beginning of their fourth year with regard to research subjects and hours.

MINERALOGY VIIa

For third year students in Course M.

ORE MINERALS—Their properties, chemistry and association. A course of lectures for third year Metallurgy students consisting of the first term lectures of Mineralogy IV.

Lectures—Tuesday and *Thursday* at 8, first term.

GRADUATE COURSES

For graduates in Courses A and C.

MINERALOGY XV.

ADVANCED OPTICAL MINERALOGY—A course designed to give students further training in the determination of optical properties of minerals. Special study will be made of igneous and metamorphic minerals, and of the heavy residuals of sedimentary rocks. Not offered during session 1939-40.

Lectures and Laboratory—6 hours a week, to be arranged.

Professor Hawley.

MINERALOGY XVI.

(a) ADVANCED STUDY OF ORE MINERALS AND MINERALOGRAPHY:

Texts—Lindgren's *Mineral Deposits* (McGraw Hill 1933).
Determination of the Opaque Minerals—C. M. Farnham, 1st Ed. (McGraw Hill, 1931).

This course alternates with Mineralogy XV. Offered in session 1939-40.

Lectures and Laboratory—Four hours a week to be arranged.

Professor Hawley.

MINING ENGINEERING.

PROFESSOR—S. N. Graham, B.Sc.

MINING I.

For students in Course A, third year.

The first part of this course includes a discussion of the shape and attitude of ore bodies and the description of the methods of surveying the underground openings required to work them. This is accompanied by drafting room work on mine mapping.

The lectures for the balance of the year include the following subjects:

Prospecting for lode and placer deposits.

Mining laws and the methods of staking and acquiring mineral prospects.

Exploration and development of prospects.

Boring by diamond, churn and other drills.

Rock drills and steel used in mining operations.

Explosives, their characteristics and uses.

Systematic development and methods of shaft-sinking, drifting, cross-cutting and raising.

A brief description of the common mining methods.

One hour per week in the second term will be given to the reading and discussion of essays on prescribed subjects.

Text Books—Peele, *Mining Engineers Handbook.*
Lewis, *Elements of Mining.*

Lectures—Monday, 9-10; *Tuesday,* 9-10 (a); *Thursday,* 9-10 (b).

Laboratory—Monday, 10-11; and *Tuesday,* 10-11, first term.

Professor Graham.

MINING II.

For students in course A, fourth year.

This course is a continuation of Mining I and includes the following subjects:

Rock pressure and methods of support.

A systematic study of underground metal mining methods.

A brief discussion of open-pit, placer and coal mining methods.

Transportation, including mucking, tramming and hoisting.

Drainage, source of water and methods of handling it.

Mine atmospheres and mine ventilation.

The sampling and estimation of ore.

A study of mine organization and mining costs.

Mine valuation and reports.

The course will also include a brief discussion of the principles underlying the more common methods of geophysical prospecting, with special attention to electrical and magnetic methods.

Two hours per week throughout the year will be given to the reading and discussion of papers on prescribed subjects.

Text Books—Peele, *Mining Engineers Handbook.*
Lewis, *Elements of Mining.*

Lectures—Monday, 8-9; *Tuesday,* 8-9; and *Wednesday,* 10-11.

Laboratory—Monday, 2-3; *Tuesday,* 1-2, first term and 2-3 second term.

Professor Graham.

Mining III.

For students in Course A, fourth year.

The first term work includes practice and problems in Mine Surveying, also the reduction and plotting of a mine survey.

In the second term these hours are given to furnace and metallurgical work or to any subject suitable to the course, as a subject for designing, for example, the designing of mill, smelter, surface plant of a mine.

Wednesday, 1-4.

Professor Graham.

Mining IV.

For students in Courses C and M, fourth year.

This is a course of lectures briefly discussing the formation of ore-bodies, their development and exploitation, the machinery and equipment required, and the sampling and valuation of mining properties. It is intended to link up the work of the geologist and metallurgist with the mine.

Text Book: Lewis, *Elements of Mining.*

Lectures— Monday 1-2. Professor Graham.

Summer Essay.

For students in Course A, fourth year.

In order to encourage close observation, and the faculty of expressing by text and illustration, the student during his summer vacations is expected to gather material for an essay of from two to three thousand words.

The essay must cover the result of personal observation and be on some subject relating to mining, milling, metallurgy or geology.

The subject title must be given before the end of October, and the essay handed in before the first of March. Essays requiring revision must be returned before the spring examinations begin.

All essays must be type-written and suitably bound.

Ore Dressing.

For students in Courses A, C and M, third year.

These lectures follow the sequence of operations on an ore from the time it reaches the mill until it leaves as a concentrate or bullion. The principles and practice of rock crushing, ball milling, classification and concentration on jigs and tables are fully discussed. Particular attention is paid to the concentration of ores by flotation. Other accessory processes such as magnetic concentration are taken up and the flow sheets of different mills are studied.

Books of references: Taggart—*Handbook of Ore Dressing.*
Truscott, *Ore Dressing.*
Richards & Locke, *Textbook of Ore Dressing.*

Lectures—Thursday, 11-12; and *Wednesday,* 8-9, second term.

Professor Graham.

Milling.

For students in Course A and M, fourth year.

Ores of the more common metals are investigated in the laboratories to determine suitable methods of concentration of or recovery of their metals by milling. Groups of two or three students are given an ore to investigate. Examination of the ore is first carried through by use of the microscope, by screen analyses, etc. Based on the information thus gained, a course of treatment on a sample of the ore is carried through. Each student takes part in the investigation and treatment of as many ores of the precious metals, and also of those of base metals as time will permit.

Laboratory—Friday, 9-4, and *Saturday,* 9-12.

Professor Lord.

Ore Dressing Laboratories

These are equipped for the testing of ores in small lots from various mining districts.

The equipment consists of a 7 x 10 Blake crusher, rolls and fine grinders. There is a complete equipment of modern small, or miniature machines for testing ores and illustrating principles and processes of treatment. These consist of small ball and pebble mills, various types of screens and classifiers, jigs, Wilfley tables, several types of small flotation machines and magnetic concentrators.

The Metallurgical Laboratories.

The Metallurgical laboratories proper contain a blast furnace and a large roasting furnace, each served by a bag house; a Monarch oil furnace and a gas furnace for obtaining temperatures up to 1400°C; a Hoskins electric furnace for temperatures up to 1700°C; three electric arc furnaces; a vacuum electric furnace; two tubular electric furnaces; a Hump furnace; an electric muffle furnace; a recording potentiometer; thermocouple and optical pyrometers; and calorimeters.

The Fire Assaying laboratory contains seven gas muffle furnaces of different sizes, a three-muffle crude oil furnace, and four gasoline crucible furnaces.

The Metallography laboratory is equipped with a complete cutting and grinding plant; a disc polishing machine; microscopes, with complete optical equipment; a vertical micrograph outfit, and the necessary dark room and equipment; and well selected sets of specimens.

Two well appointed chemical laboratories, a balance room and a room for electrolytic assaying complete the laboratory equipment of the Department.

METALLURGY.

Professor—T. V. Lord, B.Sc.

Assistant Professor—O. A. Carson, B.Sc., Ph.D.

Metallurgy I.

For students in Courses E, F, G, third year.

A brief discussion of the physical properties and uses of the common metals. The more important industrial alloys, their composition, properties and uses. Refractory materials. The properties of iron and steel, the effects of impurities and of methods of manufacture and working, and the heat treatment of steel.

Text-book—Rosenholtz, *Elements of Ferrous Metallurgy.*

Lecture—Tuesday, 10-11 (a), *Wednesday*, 4-5 (b).

Dr. Carson.

Metallurgy II.

For students in Courses A, B, M, third year.

Heat, calorimetry and pyrometry. Solid, liquid, and gaseous fuels and the special metallurgical uses of each kind. An introduction to general metallurgy—principles, operations and appliances. The metallurgy of iron and steel.

Text-book—Rosenholtz, *Elements of Ferrous Metallurgy.*

Austin, *Metallurgy of the Common Metals.*

Lectures—Monday, 11-12; *Wednesday,* 8-9 (a); *Tuesday,* 11-12 (b).

Dr. Carson.

Metallurgy III.

For students in Course M, third year.

Metallurgy calculations based on the work covered in Metallurgy II.—heat, calorimetry, and pyrometry; heat balance, iron blast furnace charges, etc.

Laboratory—Monday, 9-10; *Wednesday* 9-10, first term; *Monday* and *Tuesday,* 10-11, second term.

Dr. Carson.

Metallurgy IV.

For students in Courses A, M, fourth year.

The metallurgy of the more common non-ferrous metals—gold, silver, copper, lead, and zinc. The extraction of these metals from their ores, the refining of the metals, their uses, and the alloys into which they enter.

A consideration of the ordinary methods of recovering nickel, cobalt, tin, arsenic, antimony, etc., from the ores.

Text-book—Austin, *Metallurgy of the Common Metals.*

Dorr, *Cyanidation and Concentration of Gold and Silver Ores.*

Lectures—Tuesday, 9-10; *Wednesday,* 11-12; *Thursday,* 11-12.

Professor Lord.

Metallurgy V.

For students in Course M, fourth year.

Metallurgical calculations related to the work covered in Metallurgy IV. Discussions of metallurgical subjects by the students and the reading and discussion of students' essays.

Laboratory—Tuesday, 11-12, first term; *Thursday,* 9-10, second term.

Professor Lord.

Metallurgy VI.

For students in Courses M, G, fourth year.

Electro-metallurgy; introductory course in electro-chemistry followed by the consideration of the electrolytic refining of copper, gold and silver and the electrical smelting of aluminum and iron ores, etc.

Lecture—Wednesday, 8-9, second term. **Dr. Carson.**

Metallurgy VII.

For students in Course M, fourth year.

Metallurgical plant design. The calculation of the capacities of units in a plant—agitators, sumps, pipes, launders, pumps, furnaces, converters, etc. Details of equipment. Flow sheets. General layout of plants. Bills of material. Power requirements.

The work will consist largely of individual problems for the library and drafting room.

Laboratory, Monday, 2-4.

Professor Lord.

Metallurgy VIII.

For students in Course F, fourth year.

Laboratory course dealing with the heat treatment of steel.

Laboratory—Friday, 8-10, first term.

Dr. Carson.

Metallography.

For students in Course M, fourth year.

Introductory course in metallography, including:

(*a*) Explanation and interpretation of equilibrium diagrams.

(*b*) Constitution and structure of some industrial alloys, with special reference to brasses, bronzes, bearing metals and different grades of steel.

Lecture and Laboratory work—Monday, 8-9; *Tuesday,* 2-5 (a), 1-4 (b).

Students in Course M, fourth year, who are going into Milling have the option of dropping Metallography at Christmas and substituting Mineralogy VIb for the second term.

Lecture—Tuesday, 1-5 (b).

Dr. Carson.

Metallurgical Laboratory.

For students in Course M, fourth year.

Laboratory course dealing with a number of metallurgical operations. The following experiments are made by the students attending this course: Determination of calorific power and impurities in coals, standardization of pyrometers by various methods, determinations of cooling curves, decomposition of sulphates and reduction of oxides, heat treatment of steel.

Electroplating, operation of electric furnaces.

Laboratory—Thursday, 1-4, first term.

Thursday, 2-5, second term.

Dr. Carson.

Summer Essay.

Required of students in Course M, fourth year.

In order to encourage close observation, and the faculty of expressing by text and illustration, the student during his summer vacations is expected to gather material for an essay of from two to three thousand words.

The subject title must be given in by October 15th of the final year, and the essay handed in before the end of the first term of the final year. Essays requiring revision must be returned before the spring examinations begin.

The material on which the essay is based must be information gained at first hand in metallurgical or chemical plants or laboratories or in mills during the equivalent of, at least, one complete summer vacation.

Fire Assaying.

For students in Courses A, M, third year, and Course C, fourth year.

The Laboratory course in fire assaying consists of:

(*a*) A number of experiments to test the action of the different reagents used and slags made in assaying.

(*b*) The determination of lead by fire assay methods.

(*c*) The determination of gold and silver in silicious, oxidized and sulphide ores and mattes.

Laboratory—First term. Course M, Section 2, *Tuesday*, 1-5. Course A, *Saturday*, 8-12, Sections 1 and 2 and Course M, Section 1; Second term. Course A, *Tuesday* 1-5, Sections 3 and 4; *Saturday* 8-12, Sections 5 and 6. Course C, *Tuesday* 1-5 (b).

CHEMICAL ENGINEERING.

Professor—L. F. Goodwin, A.C.G.I., Ph.D., F.I.C.

Lecturer—G. A. Revell, B.Sc., S.M.

All lectures and laboratory work in Ontario Hall.

Industrial Chemistry I. Engineering Chemistry.

For students in Course E, fourth year.

A lecture course developed for students in Mining, Mechanical and Civil Engineering. Topics such as the rusting of iron and its preservation from corrosion, water for steam raising and domestic use, paints, lubricants, explosives, pyroxylins and cements are discussed, mainly from the engineer's point of view.

Texts—Leighou, *Chemistry of Materials,* (McGraw-Hill Co.)
Bulletins of the U.S. Bureau of Mines, Canadian Bureau of Explosives, and other pamphlets.

Lecture—Wednesday, at 10, in Ontario Hall.

Professor Goodwin.

Industrial Chemistry II.

For students in course D, third year.

For outline of topics, see under Department of Chemistry.

Texts—E. R. Riegel, *Industrial Chemistry,*
T. M. Lowry, *Inorganic Chemistry,* (The MacMillan Co.).
or J. R. Partington, *Inorganic Chemistry.*

Lectures—Tuesday at 10; *Thursday,* 10-11, 11-12, first term, Ontario Hall.

Laboratory—Saturday, 9-12, first term, *Monday,* 10-12, second term.

Professor Goodwin and Mr. Revell.

Industrial Chemistry IIIa.—Advanced.

For students in Course B, fourth year—first term.

This course deals with the following subjects: Distillation and dephlegmation, wood distillation, alcohol, acetic acid, acetone. Manufacture of organic nitro compounds and explosives. Equilibrium and optimal conditions for contact sulphuric acid, synthetic ammonia and nitric acid processes. Catalytic reactions in industry and high pressure syntheses. The absorption of gases by liquids and solids, absorption and reaction towers, potash manufacture and recovery, recovery of waste acids, sulphite, sulphate and mechanical wood pulp.

Texts—Partington, *The Alkali Industry.*
Assigned Reading from Maxted, Catalysis and its Industrial Applications. And other publications.

Lectures—Wednesday and Friday, at 11, in Ontario Hall.

Laboratory—Monday, 1-4.

Professor Goodwin.

Industrial Chemistry iv.

Research Training

For graduate students and students in Course B, fourth year, electing thesis option in Industrial Chemistry.

Professor Goodwin.

Chemical Engineering i.

For students in Course D, third year.

A preparatory course in stoichiometrical and plant calculations, and in problems in Applied Physical Chemistry.

Text—Hitchcock and Robinson, *Differential Equations in Applied Chemistry,* (John Wiley and Sons).
Handbook of Chemistry and Physics. Hodgman-Lange.

Lecture and Laboratory—Thursday at 11, *Friday* at 9, second term.

Professor Goodwin.

Chemical Engineering II.

For students in Course D, fourth year.

Industrial Processes—The topics dealt with are similar to those under Industrial Chemistry III (a), with the addition of: Plant for nitric acid manufacture, the influence of heats of reaction. Dissolution, decantation, filtration, centrifugals. The moving of gases, liquids and solids. The measurement of gases, and their absorption by liquids and solids. Absorption and reaction towers, their design and the study of filling materials. The manufacture of nitro compounds, the concentration of weak acids and the recovery of waste acids.

Pulp, Paper and Synthetic Plastics—Absorption principles and sulphite towers. The manufacture of mechanical and sulphite wood pulp. The Kraft or Sulphate, and the soda process, modern methods of causticising, washing, and of lime, soda and heat recovery. The manufacture of gun-cotton, cordite, nitro-cellulose powder, celluloid, viscose or artificial silk, and other synthetic colloids.

A collection of industrial products and apparatus is available for demonstration, and visits are paid to outside chemical works in the final year, at which attendance is required.

Designing of Chemical Plant. Calculations and exercises in designing chemical plant and factories. Considerations underlying the choice of materials of construction, acid proof containers and cements. Manufacturing costs as dependent on the cost of plant, raw materials, labour, etc.

Texts.—Partington, *The Alkali Industry.*

Badger & MacCabe, *Elements of Chemical Engineering.*

Hougen and Watson, *Industrial Chemical Calculations.*

Assigned Reading from:

Maxted, *Catalysis and its Industrial Applications.*
Davies, *Handbook of Chemical Engineering.*
Lunge, *Sulphuric Acid and Alkali.*
And Original Publications.

Lectures—Wednesday and *Friday,* 11 a.m.

Laboratory—Saturday, 9-12, first term; *Wednesday,* 1-4, second term.

Professor Goodwin.

Chemical Engineering III.

For students in Course D, fourth year.

A detailed study of apparatus and chemical engineering plant, based on the chemical and physical conditions underlying the various processes. The elaboration in the laboratory of the best working conditions for a given chemical process.

The designing and drawing of parts of a chemical plant, based on experimental results worked out in the laboratory. Experimental work with semi-plant scale chemical engineering apparatus. Fuel and heating calculations. The gas producer. Materials of construction, stainless steels, their manufacture and equilibrium diagrams, alloys for high pressure work.

The practical work will be divided between the laboratory and the draughting room as is found necessary.

Lecture—Tuesday, 3-4, first term; *Thursday,* 10-11, *Saturday,* 11-12, second term.

Laboratory—Monday, 1-4 (a), 1-5 (b), *Friday,* 9-11.

Professor Goodwin and Mr. Revell.

Texts: *Handbook of Chemistry and Physics; or, Chemiker Kalender, or Chemical Engineer's Handbook.*

Assigned reading from:

Davies, *Handbook of Chemical Engineering.*
Lunge-Cummings, *Sulphuric Acid and Alkali.*
And published papers and pamphlets.

Chemical Engineering iv.

For students in Course D, Fourth Year.

Introduction to dimensional analysis and graphical presentation. Illustrative chemical engineering problems in fluid flow and heat transmission are given.

Lectures include the processing of raw materials in chemical plants and the necessary apparatus together with the methods and instruments used for control.

In the second term the lectures cover the metallurgy of iron and steel and some of the common metals, and non-rusting and other alloys of importance to chemical industry.

Texts—Badger and McCabe, *Elements of Chemical Engineering;* Rosenholtz, *Elements of Ferrous Metallurgy.*

Reference Text—*Chemical Engineers' Handbook,* Perry.

Lectures—Wednesday 8-9 (a); *Tuesday* 11-12 (b); *Thursday* 11-12.

Mr. Revell.

LABORATORY OF CHEMICAL ENGINEERING.

The laboratory is provided with large size models of steam-jacketed evaporating pans, porcelain lined and fitted with stirring gear, with a steam-jacketed rectifying column and still, a steam-jacketed vacuum evaporator, pump and condenser, a jacketed vacuum shelf dryer, a high pressure acid proof filter, a Sweetland self-dumping filter press with sludge tank and centrifugal pump, a Sperry plate and frame filter press, a model stream-line filter, an ordinary and a high speed centrifuge, a rotating high pressure autoclave, and with other technical apparatus. Apparatus is being installed for high pressure synthesis, up to 100 atmospheres.

There is further installed a large reaction tower of earthenware designed for experiments in recovering smelter and other fumes or gases, connected to a fan, circulating and measuring devices, and with selected types of earthenware filling material.

Instruction in this laboratory is planned to train the student to handle fairly large quantities of material and to become familiar with standard types of technical chemical apparatus, to work out the experimental methods required for attacking a manufacturing problem, and to translate the laboratory results obtained into practice.

CIVIL ENGINEERING.

PROFESSOR—A. Macphail, B.Sc., LL.D.
PROFESSOR—W. P. Wilgar, B.Sc.
PROFESSOR—D. S. Ellis, B.Sc., M.A., M.C.E.
ASSISTANT PROFESSOR—R. A. Low, B.Sc., M.C.E.
ASSISTANT PROFESSOR—J. B. Baty, B.S.
LECTURER—M. W. Huggins, M.A.Sc.
DEMONSTRATORS—M. A. Dolan, B.Sc.
C. O. P. Klotz, B.Sc.

GENERAL ENGINEERING I.

For students in all Courses second year.

This subject embraces the physical properties of materials used in the different branches of engineering and the principles involved in the theory of beams, columns, and structures.

MATERIALS OF CONSTRUCTION—Resistance of elasticity of materials; stresses in brick, cement, mortar, and concrete; physical properties of the metals and alloys used in engineering, and effects of impurities in them; testing for tensile, compressive and transverse strength.

GRAPHICAL STATICS. Graphical representation of stress; funicular and force polygons; dead and wind loads; graphical methods of determining centres of gravity, shear and bending moments.

MECHANICS OF MATERIALS.—Resistance and elasticity of materials; stress and strain diagrams; bending and shearing forces; compound stress; deflection of beams; columns and struts; riveted joints; centres of gravity and moments of inertia.

Text-books—Wolfe, *Graphical Analysis.*
Seely, *Resistance of Materials.*

Books of Reference:
Merriman, *Strength of Materials.*
Thurston, *Materials of Construction.*
Merriman and Jacoby, *Roofs and Bridges, Part II.*
Slocum & Hancock, *Strength of Materials.*

Lectures—Monday and *Friday,* 11-12, Sections 1 and 2; 9-10, Sections 3 and 4, A. B. C. D. M.; 10-11, E. F. G.

Mr. Huggins.

General Engineering II.

For students in Course E, third year.

Graphical Statics. Graphical determination of stresses in roof trusses, bridges, cranes, earth-works, retaining walls, dams, arches, arched ribs, cantilever and suspension bridges.

Mechanics of Materials. Analysis of restrained and continuous beams and columns; torsion of shafts; combined stress; flexure of beams and theorem of three moments; influence lines; reinforced concrete; plate and lattice girders and columns; resilience and fatigue of materials; initial and temperature stresses; earthworks, retaining walls and dams; arches and arched ribs; suspension bridges.

Theory of Structures. Girders, roofs and bridges; selection of types with reference to span, laading head-room, cost and other considerations; relative advantages of riveted and pin connections; wind bracing and stiffening trusses; trestles and towers.

Text-books—Wolfe, *Graphical Analysis.*
Merriman, *Mechanics of Materials.*

Books of Reference—
Slocum & Hancock, *Strength of Materials.*
Bovey, *Theory of Structures.*
Merriman and Jacoby, *Roofs and Bridges, Parts, I., II., III.*

Lecture—Tuesday, 11-12; *Thursday,* 10-11.

Professor Macphail.

General Engineering III.

For students in Courses, A, D, M, E, F, G, third year.

This course consists of practical work in the mechanical and testing laboratories. Its object is to give the student a knowledge of the practical application of the fundamental principles of engineering in general.

Routine tests of cement, lime, mortar, brick, stone, timber, iron, steel, etc. Specific gravity, fineness, tensile and compressive strength of cement, etc.

Demonstration Photo-Elastic methods.

Measurement of mechanical power by means of indicators, dynamometers, etc. Simple experiments in thermodynamic laboratory.

Laboratory—Monday, 1-3, for A and E.
Monday, 3-5, for D, F, G and M Students.

Professor Ellis, Mr. H. G. Conn.

General Engineering IV.

For students in Course E, fourth year.

Independent work in the testing laboratories.

Laboratory—Tuesday, 1-4, first term.

Professor Wilgar.

General Engineering V.

For students in Courses A, D, F, M, third year.

A combined course of lectures, and designing covering the same subjects as in General Engineering II.

Text-books—Same as for General Engineering II.

Lecture—Wednesday, 9-10, A, D; *Wednesday,* 11-12, M, F; *draughting Thursday,* 2-5, for A, Sects. 1, 2, 3, 4, and M students, *Friday,* 1-4 for A, Sects. 5 and 6, D and F students.

Professor Macphail, Professor Low.

General Engineering VI.

For students in Course E, third year.

Graphical Representation. Representation of engineering formulae and data. Progress and cost diagrams, interpretation of diagrams, solution of problems by means of diagrams.

Graphical Statics. Continuation of work in General Engineering I., with relation to roofs, bridges, arches, reinforced concrete and other structures.

Text-book—Wolfe, *Graphical Analysis.*
A.I.S.C. Steel Construction.

Lecture—Wednesday, 9-10.

Draughting—Friday, 1-4. Mr. Huggins.

Structural Engineering I.

For students in Course E, third year.

The work of this class comprises lectures and draughting room work in the design of buildings.

In the draughting room students are required to design and detail structures and structural members.

Text-book—Young, *Structural Problems, A.I.S.C. Steel Construction.*

Books of Reference—*Standard Specifications for Concrete and Reinforced Concrete.*
Urquhart-O'Rourke, *Design of Concrete Structures.*
Hool-Johnson, *Handbook of Building Construction.*
Hool-Kinne, *Stresses in Framed Structures.*
U.S. Forest Products Laboratory—*Wood Handbook.*

Lecture—Thursday, 9-10.

Draughting—Thursday, 1-4.

Mr. Huggins.

Structural Engineering II.

For students in Course E, fourth year.

Design of reinforced concrete structures. Foundations of bridges, buildings and other structures, cofferdams, caissons, substructure types and designs.

Text-books—Urquhart and O'Rourke, *Design of Concrete Structures.*
and
Jacoby and Davis, *Foundations of Bridges and Buildings.*

Books of Reference—
Haydon, *The Rigid Frame Bridge.*
Turnaure and Maurer, *Principles of Reinforced Concrete Construction.*
Caughey, *Reinforced Concrete Construction.*

Lectures—Monday, 1-2, *Thursday,* 10-11, first term; *Tuesday,* 10-11, *Thursday,* 10-11, second term.

Draughting—Monday, 2-4, first term; 1-4, second term; *Friday,* 1-4.

Professor Wilgar

Structural Engineering IV.

For students in Course E, fourth year.

Design of Structures. Lectures comprise the design of details in steel bridge trusses and other structures.

Projects will be given to the class in Bridge Design according to Standard Specifications, usually consisting of riveted truss, pin-connected truss, etc. Complete stress sheets, working drawings, estimates, etc., being required.

Text-books—Ketchum, *Structural Engineer's Handbook; Steel Handbook.*

Books of Reference—
Merriman and Jacoby, *Roofs and Bridges, Pts. I.-IV.*
Waddell, *Bridge Engineering.*

Lecture—Tuesday, 9-10.

Draughting—Wednesday, 1-4; *Friday,* 10-12.

Professor Macphail.

Hydraulic Engineering I.

For students in courses E, F, G, third year.

Application of hydrostatic pressure in the case of dams, gates and pipes. Flow of water and other fluids and measurement of volume by various orifices and weirs. Flow in open channels, ditches, flumes, etc., and the use and application of these conductors of waters. Flow through tubes and pipes. Use of pipes as conductors of supply for domestic and power purposes. Dynamic and static pressure as applied to motors for power purposes. Study of flow of liquids other than water.

Experiments to cover above principles.

Text-book—Daugherty, *Hydraulics.*

Professor Ellis.

Lectures—Tuesday, 9-10, *Wednesday,* 8-9, E, F, G.

Hydraulic Engineering II.

For students in E, F, and G, fourth year.

Comprises the study of centrifugal pumps, fans and hydraulic turbines; the elements of hydrology, the design and construction of dams and appendages; measurement, development and transmission of water power; the design of hydraulic power plants:

Problems in relation to these subjects.

Text-books—*Hydroelectric Hand Book,* Creager and Justin.
Hydraulic Structures, Schoklitsh.
Air Conditioning and Engineering.
Centrifugal Pumps—Daugherty.

Lecture—Monday, 11-12 and *Thursday,* 9-10, F., *Tuesday,* 8-9, *Friday,* 9-10, E. G. Professor Ellis.

Hydraulic Engineering III.

For students in Courses E, F, G, fourth year.

Work in Hydraulics Laboratory on selected experiments dealing with hydrostatic pressure, orifice, and weir flow, flow through pipes and open channels, loss in valves and pipe fittings, efficiency tests on centrifugal pumps, and reaction and impulse turbine. Investigation of flow in draft tube. Air flow in ducts. Tests on fans. Studies on air foils, etc., in wind tunnel.

Laboratory—Wednesday, 1-4 G, first term. *Saturday,* 9-12 E, second term F—*Tuesday,* 1-4, second term. Professor Ellis.

Hydraulic Engineering IV.

For students in Courses A, D, M, of fourth year.

Hydrostatics as applied to dams, gates, pipes, etc. Flow of water and other liquids through orifices, pipes, and channels; study of water wheels and pumps; hydraulic models; air flow; fans; ventilation problems on mines and buildings.

Demonstration of experiments in Laboratory.

Text-books—*Hydraulics,* King and Wisler.
Theory and Practice of Mine Ventilation, Montgomery.
Mine Ventilation, Weekes.

Lectures—Thursday, 10-11 (a); *Friday,* 8-9 (a); *Tuesday,* 10-11 (b) A; *Thursday,* 10-11 (b) A; *Wednesday,* 10-11 (b) D, M; *Thursday,* 1-2 (b) D, M. Professor Ellis.

Railway Engineering I.

For students in Course E, third year.

The work of this class comprises the study of economics of railway location; estimation of traffic; effects of distance, rise and fall and curvature on costs of operation; the paper location of a railway; economic selection of alternative routes; turnouts; crossings; Mass diagrams; overhaul; estimation of costs of construction; signalling, yard design and operation.

Text-book—Webb, *Railroad Construction.*

Lectures—Monday, 11-12; *Friday,* 11-12.

Field Work and Draughting—Wednesday, 1-4. Professor Wilgar.

Engineering Economics.

For students in Course E, fourth year.

Valuation of public utilities, depreciation, amortization, government control of public utilities as exemplified by the Railway Act. Engineering Contracts and Specifications. Economic selection of structures and plant.

Each student will be required to address the class on a subject of his own selection.

Books of Reference—Gillette and Dana, *Construction Cost Keeping and Management.*
Mead, *Contracts, Specifications and Engineering Relations.*

Lecture—Monday, 10-11. Professor Wilgar.

Municipal Engineering I.

For students in Course E, third year.

Discussion of Municipal Problems. Civic Government, financing of work, debentures and assessments, introduction to sewerage and water supply, roads, walks, gutters, excavation, macadam roads and block paving.

Laboratory work includes the design of a domestic sewerage system, and laboratory practice in sewage and water treatment.

Lectures—Monday, 10-11 and *Tuesday* 10-11, second term.

Laboratory—Tuesday 1-4, second term.

Special notes and references to chapters in Text-books for Municipal Engineering II and III and Highway Engineering. Professor Baty.

Municipal Engineering II.

For students in Course E, fourth year.

Water Supply. Municipal water supply. Rainfall. Source of supply. Quantity, quality and purification of water. Distribution, designing and details of construction. Domestic systems.

Text-book—Turneaure and Russell, *Public Water Supplies.*

Lecture—Thursday, 11-12.

Laboratory—Thursday, 1-4 (in part) Professor Baty.

Municipal Engineering III.

For students in Course E, fourth year.

The Collection and Disposal of Sewage and Refuse.

Sewage. The various systems for the collection and removal of sewage. Consideration of rainfall, run off, and water consumption. Grades and flow in sewers. Design. Methods of construction and materials used. Plumbing. Maintenance of sewer systems, including ventilation, flushing, and inspection.

Sewage Disposal. Methods employed, design, construction, and maintenance of the various systems.

Refuse Disposal. Kinds of refuse. Methods of collection and disposal and economic value of same. Incinerators.

Text-book—Metcalf and Eddy—*Sewerage and Sewage Disposal.*

Books of Reference—Metcalf and Eddy, *American Sewerage Practice Vols. I. II. and III.*
Babbit, *Sewerage and Sewage Treatment.*

Lecture—Tuesday, 11-12. Professor Baty.

Laboratory—Thursday 1-4, second term.

Note.

Work in Municipal Engineering II and III and Highway Engineering has been arranged for one period of three hours per week, *Thursday,* 1-4. Projects in water works, sewer designs, etc., are set and completed during these hours. As far as possible each student will be given separate problems. A time limit is set on each problem.

Highway Engineering.

For students in Fourth Year, Course E.

Country and city roads and pavements. Lay out, grades, and roadbeds. Various kinds of pavements and methods of construction. Cost and durability. Method of dust prevention. Low cost bituminous roads. Soil mechanics. Traffic control. Street railway track work.

Projects in highway work are set under actual conditions for design and estimate.

Text-book—Bruce, *Highway Design and Construction.*

Books of Reference—*American Highway Engineers Handbook.*
Blanchard and Drowne, *Highway Construction.*
Agg, *Construction of Roads and Pavements.*

Lecture—Wednesday, 11-12.

Professor Wilgar.

Laboratory—Thursday, 1-4, first term, in part.

Surveying.

All branches of Surveying receive full consideration. During the outdoor instruction students are given every opportunity to become familiar with the instruments. Notes of all field work are plotted in the draughting-room, and the rules and regulations for field work and instruments-room must be strictly adhered to. Students must be engaged in the work of a class in the hours set apart for it, otherwise their attendance will not be counted. Attendance and character of work done will be considered in the class standing.

Surveying I.

Required of all first year students.

The description, use, adjustment and care of chains, tapes, compasses, levels, transits and minor surveying equipment. Methods employed in elementary surveying.

The practical work in the field and draughting rooms is an important part of this course.

Text Books—Davis, Foote and Rayner—*Surveying.*
Breed and Hosmer: *Elementary Surveying.*

Lecture—(*Field Work*), *Sects.* 1, 2, *Friday,* 1-3, *Sects.* 3, 4, *Monday,* 1-3.

Lecture—(*Field Work*), *Sects.* 5-6, *Friday,* 9-11, *Sects.* 7-8, *Monday,* 9-11.

Professor Low, Mr. Klotz.

Surveying II.

For students in all courses, second year.

It continues the work of Surveying I., and includes Land Surveying—Route Surveying—profiles, circular and vertical curves, earthwork, elements of switchwork: Topographic Surveying—with stadia, plane table, hand level, and transit and level; Hydrographic Surveying—Methods, sextant, river surveying, stream flow; Laying out of buildings and engineering construction. Underground Surveying. Observations. Errors.

Text Books—Davis, Foote and Rayner—*Surveying.*
Breed and Hosmer: *Elementary Surveying.*

Lecture—A. B. C. D. M., Sections 1-2, *Wednesday,* 8-9; *Sections* 3-4, *Thursday,* 10-11; E. F. G., *Tuesday,* 8-9.

Field Work and Draughting—A. B. C. D. M., Sections 1-2, *Wednesday,* 9-12; Sections 3-4, *Saturday,* 9-12; E. F. G., Sections 1-4, *Tuesday,* 9-12; Sections 5-6, *Tuesday,* 1-4.

Professor Low, Mr. Klotz.

Surveying III.

For students in Course E, third year, first term.

Topographic Surveying, Stream Measurement, Hydrographic Surveying, Mine Surveying, Base Line Measurement, Triangulations, Adjustment of simple figures, Computation of coordinates, Map Projections; Precise levelling; Observations for Azimuth, Latitude, Time. Introduction to adjustment of observations. Outlines of D.L.S. and O.L.S. systems. Descriptions.

Practice. Field work taken at Field Survey class which is pre-requisite.

Text-book—Davis, Foote and Rayner, *Surveying.*

Lecture—Wednesday, 10-11, first term.

Field Work and Draughting—Tuesday, 1-4, first term.

Professor Ellis.

SURVEYING FIELD WORK

The class in surveying field work is intended to give the third year students in courses A, C and E an opportunity to become familiar with instruments and methods of survey under conditions approximating those of commercial work. It is prerequisite for Surveying III.

The syllabus covers field work on the following lines, simple triangulation, base lines, stadia, plane table, location of engineering structures, land boundaries and possibly soundings and stream measurements; azimuth observations on sun and polaris, mine surveying.

In rotation each student will take charge of his own party and ability to organize and direct work will in part determine his standing.

Individual copies of the notes will be prepared day by day by the note recorders of each party. These will be used later in preparing plans, etc. Observations, etc., will be worked out as taken.

The work will be carried out in the vicinity of Kingston. Transport will be arranged by the department. Students will require to carry lunches on most days. Each student will require tables, etc., and *a reading glass is compulsory.*

Students intending to take this class are required to notify the Registrar not later than August 1st.

The class work will commence at 9.00 a.m. on Monday, September 11th, and will end Saturday, September 23rd.

Professor Ellis and Professor Low.

ELECTRICAL ENGINEERING.

PROFESSOR—D. M. JEMMETT, B.Sc., M.A.
ASSISTANT PROFESSOR—H. H. Stewart, B.Sc., M.S.
LECTURER—H. S. Pollock, M.Sc.
DEMONSTRATORS—R. A. Doherty, B.Sc.
D. M. Bews, B.Sc.

ELECTRICAL ENGINEERING I.

FUNDAMENTAL PRINCIPLES

For third year students in Courses A, D, M, E.

The electric circuit. The magnetic circuit. Generated and induced electro-motive forces. Self and mutual induction. Elementary theory of alternating and direct current generators and motors. Common systems of transmission and distribution of electric current. General principles of illumination. Storage batteries.

Lectures—Monday, 10-11 (a), 9-10 (b); *Friday,* 10-11, for D, M and E students; *Tuesday,* 11-12 (a), 9-10 (b) and *Friday,* 8-9 for A students.

Laboratory—D, M, *Monday,* 1-3; A, Sects. 1, 2, 3, and E, *Monday,* 3-5; A, Sects. 4, 5, 6, *Wednesday,* 10-12.

Mr. Pollock, Mr. Doherty and Mr. Bews.

Electrical Engineering II.

For third year students in Courses G and H.

Alternating currents. The use of the complex quantity. Energy and power in A. C. circuits. Laws governing the flow of current in circuits containing resistance, inductance and condensance. The theory, construction and operation of the transformer. Meters and the measurement of electrical quantities.

Lectures—Wednesday, 9-10; *Thursday,* 11-12. Professor Stewart

Laboratory—Tuesday, 1-4. Professor Stewart, Mr. Doherty.

Electrical Engineering III.

For third year students in Course G.

The electric and magnetic circuits, hysteresis and hysteresis loss. Measurement of magnetic quantities. Some simple transients. Theory of direct current generators and motors. Series, shunt and compound machines. Energy losses, efficiency and commutation, methods of control, Storage batteries. Application of direct current in commercial work. Illumination and photometry.

Lectures—Monday, 9-10 (a); *Tuesday,* 10-11 (b); *Wednesday,* 11-12; *Thursday,* 10-11. Professor Jemmett.

Laboratory—Saturday, 9-12. Professor Jemmett, Mr. Bews.

Electrical Engineering IV.

For third year students in Course F.

The electric circuit. Continuous-current meters. Continuous-current generator and motor. Batteries. Illumination.

Lectures—Monday, 9-10, (a); *Tuesday,* 10-11 (b); *Friday,* 11-12 (a); *Thursday,* 8-9 (b). Mr. Pollock.

Laboratory—Tuesday, 3-5. Mr. Pollock, Mr. Doherty, and Mr. Bews.

Electrical Engineering V.

For fourth year students in Course G.

Theory of alternating current generators. Synchronous and Asynchronous Motors. Rotary Converters. Potential Regulators. Phase changing. Multiphase Systems. Transmission of power. Applications of alternating current in commercial work.

Lectures—Monday, 11-12; *Tuesday,* 9-10; *Thursday,* 11-12; *Friday,* 10-11. Professor Jemmett.

Laboratory—Thursday, 1-4; *Friday,* 1-4.

Professor Jemmett and Mr. Doherty.

Electrical Engineering VI.

For third year students in Courses G and H.

Properties of electrons and their dislodgement from atoms of vapours, gases and solids. Physics of thermonic vacuum tube. Photo electricity. Gaseous rectifiers.

Lectures—Monday, 9-10 (b); *Thursday,* 9-10 (b).

Professor Stewart.

Electrical Engineering VII.

For fourth year students in Course F.

Fundamental principles of alternating-current circuits. Single phase and polyphase circuits. Study of the alternating-current generator, the transformer, the induction motor, the synchronous motor, single-phase motors, and rectifying devices.

Lectures—Monday, 10-11; *Wednesday,* 1-2. Professor Stewart.

Laboratory—Wednesday, 2-4. Professor Stewart and Mr. Bews.

Electrical Engineering VIII.

For fourth year students in Courses G and H.

Exact solution of transmission lines in the steady state. The general differential equation. Solution in hyperbolic functions. Free, grounded and loaded lines. Nominal and Equivalent π and T lines. Constant voltage systems. Theory of Filters. Use of complex circular and hyperbolic tables and charts. Solution of power and telephone lines.

Lecture—Monday, 10-11.

Laboratory—Tuesday, 1-4 (a); 2-5 (b). Professor Jemmett.

Electrical Engineering X.

For fourth year students in Course G.

Design and Calculation of performance of transformers, generators and motors.

Lecture—Tuesday, 11-12 (a); 10-11 (b).

Draughting Room—Monday, 1-4. Professor Stewart.

Electrical Engineering XII.

For fourth year students in Courses G and H.

A course for the study of the various types of electron tubes and their applications. The three-electrode vacuum tube as an amplifier, oscillator, detector and modulator. Special types of vacuum tubes. Application of electron tubes to radio, wire telephony and power.

Lectures—Wednesday, 10-11; *Thursday,* 10-11. Professor Stewart.

Laboratory—Saturday, 9-12. Professor Stewart and Mr. Pollock.

Electrical Engineering Laboratories.

Laboratories Nos. 1, 2, 3 and 4 are equipped with standard types of direct and alternating current machines which include synchronous motors and generators, rotary converters, polyphase induction motors, repulsion and compensated induction motors, constant current transformers, series and potential transformers, power transformers, direct current shunt, series and compound wound machines. A complete set of rheostats and brakes with all necessary meters are available for determining the performance of these machines.

Laboratory No. 5 is the radio laboratory and is equipped with power supplies of all kinds necessary for vacuum tube experiments, audio frequency oscillators and calibrated attenuators, vacuum tube voltmeters, a signal generator and output meter for measuring receiving characteristics, a distortion and noise measuring set, two audio frequency bridges for measurement of resistance, inductance and capacity and all necessary meters. A magnetic and a cathode ray oscillograph are available for wave form study.

Laboratory No. 6 contains the experimental broadcasting station CFRC which operates on a commercial basis for about sixteen hours a day.

Laboratory No. 2 contains the storage battery, balancer and booster control panels and a transformer giving voltages up to 100,000 volts. A sphere gap voltmeter is available for measuring high voltages.

Power is available from the University Plant at 220/110 volts D.C. direct or through a motor—generator set which delivers power at 120/60 volts D.C. and 2 phase 85 volts 25 cycles A.C. A 125 volt, 200 ampere hour storage battery and city power at 3 phase 220/110 volts 60 cycles are also provided.

A large number of circuits which have terminals in the various laboratories enable power to be easily transferred from any machine to any other machine.

The University Power Plant is a combination direct and alternating current system making available for study and observation such apparatus as D.C. generators, synchronous motors, Tirril regulators, balancer sets, storage batteries, power transformers, watthour meters, boosters, switchboard apparatus, etc.

The City of Kingston has a new and up-to-date hydro-electric station, to which visits are made for instruction and observation.

MECHANICAL ENGINEERING.

Professor—L. M. Arkley, M.Sc.
Associate Professor—L. T. Rutledge, B.A.Sc.
Lecturer—H. G. Conn, B.Sc.

Mechanical Engineering I.

Elements of Machine Design.

For students in courses F and G, third year.

The work in this class comprises a study of the following:—Characteristic of materials used in machine construction; a review of the principles of simple stress and bending moments, their application to beams, columns and machine fixtures; principles governing design, selection of working

stresses; horizontal and vertical shear and compound stress; distribution of stress in machine parts; analysis of stress and design of fixtures; for example, rivetted connections, bolts, nuts, screws, keys, cotters and pins; analysis of stress in simple shafting, crank shafts on two bearings; shaft couplings; miscellaneous problems of design, i.e., design of wall brackets, bases and frames for machinery; bearings; graphical solutions applicable in design, i.e., Mohr's Method of determining the position of the Centre of Gravity and Moment of Inertia of a complex section; study of manufacturing and machine processes as applied to the manufacture of machinery.

Text-books—*Fundamentals of Machine Design* by Norman Ault and Zarobsky; Marks, *Mechanical Engineers' Handbook.*

Lectures—Monday, 10-11; *Tuesday,* 11-12, F. and G.

Professor Rutledge.

Mechanical Engineering II.

Transmission of Power and Machinery.

For students in courses F, G, third year.

The work in this class consists of analyses of stress and design of power transmission systems, comprising belt, rope, chain and gear drives; study of couplings, friction clutches and brakes. Dynamics of Machinery including speed fluctuations in machinery, kinetic energy of machines, inertia, proper weights of flywheels, accelerations in machines and their effects. Disturbing forces: stresses due to inertia, balancing of machinery.

Text-books—*Fundamentals of Machine Design* by Norman Ault and Zarobsky; *Theory of Machines,* by Angus; Mark's *Mechanical Handbook.*

Lectures—Monday, 11-12; *Friday,* 9-10 and 11-12; second term only.

Professor Rutledge.

Mechanical Engineering III.

Practical Machine Design.

For students in courses F, D, M, third year.

This course is a practical application of work taken up in Mechanical Engineering I. and II., which courses are prerequisites of the course Mechanical III., Dept. F.

Draughting—Wednesday, 1-4, F: *Thursday,* 1-4 F; *Wednesday,* 1-4, D and M, second term.

Professor Rutledge, and Demonstrator

Mechanical Engineering IV.

The Elements of the Power Plant

For students in Courses A, D, E, and G, fourth year.

This course covers the following:—Fuels and combustion; transfer of heat; heating surface; generation of steam; types of boilers; chimneys; artificial draft; smoke prevention; mechanical stoking; coal handling; use of superheated steam; feedwater heaters; condensing systems; pumping machinery; compressed air; gas and oil engines; gas producers and heating systems.

Lectures—Thursday, 9-10, and *Tuesday*, 10-11 (a), 1-2 (b).

Professor Arkley.

Mechanical Engineering V.

Advanced Machine Design

For students in Course F, fourth year.

This course consists of a more intensive treatment of the elements of Machine Design and a more intensive study of simple and combined stresses. It covers the following:—Theory of the curved beam and the application of the theory to the design of curved beams, crane hooks, curved links, rings, punch press frames; eccentricity of loading; stress in a member acting as a beam and a strut simultaneously; the study of stresses in crank shafts including multiple cylinder crank shafts with more than two bearings; forces acting on and through the moving parts of machines involving the study of kinetics; analysis of stress in a member which is built up of two or more materials of different values of the modulus of elasticity; effect of wide variations of temperature on stress values in machine parts. Analyses of stresses in automobile parts.

This course includes the study of lubrication and lubricants, the design of bearings of all types; the design of flywheels, brakes, clutches, spiral and worm gearing; the mechanical details and design of mine hoisting equipment, miscellaneous mine machinery such as skips, cages, mine cars and loading pockets.

Tool engineering including the design and operation of cutting tools, jigs, fixtures, gauges, cams. Studies of manufacturing processes and methods in automobile and aircraft manufacture and assembly; safety devices and equipment in industry.

Text-books—Reference books and technical journals in the Mechanical Library.

Lectures—Tuesday, 10-11; *Wednesday*, 11-12; *Thursday*, 11-12.

Laboratory—Monday, 1-4; *Tuesday*, 1-4 (a).

Professor Rutledge.

Mechanical Engineering VI.

Design of Power Plants, Heating, Ventilating and Refrigeration.

For students in Course F, fourth year.

This course deals with the following:—The proportioning and selection of elements and their combination in steam power plants to obtain the maximum profit from investment and operation. Theoretical and practical principles governing the design and operation of gas producer plants. Power plant testing methods and apparatus.

Heat losses from buildings; design of warm air, hot water and steam heating systems. Discussion of refrigeration systems.

Text-books—Reference books in Library, Hoffman, *Heating and Ventilating; Heating, Ventilating and Air Conditioning* by Allen and Walker.

Lectures—Wednesday, 10-11 (a), and *Thursday,* 10-11.

Professor Arkley.

Mechanical Engineering VII.

Practical Machine Design.

For students in Course G, third year.

This course is a practical application of work taken up in Mechanical I. and II. which courses are pre-requisites of the course.

Draughting—Thursday, 1-4. Professor Rutledge.

Mechanical Engineering VIII.

Fuel Testing.

For students in Course F, fourth year.

This course covers the following:—

Testing of fuels, gaseous, liquid and solid, with respect of their suitability for power generation. Gas and fuel analysis. Calculation and calorimetric determination of the heating value of fuels. Gas analysis in connection with the operation of steam boilers, gas and gas producers. Physical tests of lubricants. Causes and prevention of boiler scale. Treatment of feed-waters.

Laboratory—Thursday, 1-4; *Saturday,* 9-12, second term.

Professor Arkley and Demonstrator.

Mechanical Engineering IX.

Kinematics of Machinery.

For students in Courses E, F, and G, second year.

This course treats of the theory of mechanisms with special attention to the following: The nature of a machine; uniform and variable motion in machines; velocity diagrams, motion diagrams using the phorograph method; applications to various mechanisms found in engines, locomotives and machinery; crank effort and torque.

The design of gears and cams are treated from first principles including development and design of tooth profiles for cycloidal involute and stub teeth; simple, compound and epicyclic gear trains and proportioning of speeds in machine tools.

Text-book—Angus, *Theory of Machines.*

Lecture—Wednesday, 10-11.

Draughting—Sections 1, 2, 3, *Thursday,* 1-3; Sections 4, 5, 6, *Thursday,* 3-5.

Professor Rutledge and Demonstrator.

Mechanical Engineering XI.
Internal Combustion Engines.

For students in Course F, fourth year.

This course consists of the design of gas, gasoline and oil engines, suitable for use in automobile, tractors and stationary engines.

Text-book—Streeter and Lichty, *Internal Combustion Engine.*

Lecture—Wednesday, 8-9 (a) and 10-11 (b). Mr. Conn.

Mechanical Engineering XII.

A short course in the Elements of Machine Design for third year D and M students.

Similar to Mechanical Engineering I.

Lectures—Tuesday, 11-12 (a); *Thursday,* 10-11 (b) Mr. Conn.

Thermodynamics I.
Elementary Thermodynamics.

For students in Courses A, D, M, E, F, and G, third year.

The course consists of a study of the following:—Fundamental laws of Thermodynamics; specific heats; special changes of state, i.e., constant volume, constant pressure, isothermal, adiabatic, polytropic; ideal cycles with perfect gases. Carnot, Stirling and Ericsson cycles; air compression, work and temperatures, maximum economy of compression; thermal properties of saturated vapors and of vapor and liquid mixtures; properties of steam; use of steam tables; miscellaneous type problems on the above.

Text-book—*Elementary Engineering Thermodynamics* by V. W. and G. A. Young.

Lectures—A, *Friday,* 10-11; D, M, E, F, G, *Friday,* 8-9.

Professor Rutledge.

Thermodynamics III.
Advanced Thermodynamics.

For students in Courses D, and F, fourth year.

This course treats of the following:—Theory of refrigerating machines and systems. Entropy and entropy-temperature diagrams. Superheated steam. Performance of actual engines. Influence of size, speed, valve gear

and ratio of expansion on economy. Steam jackets, Compound and triple expansion engines. Advanced theory of gas and oil engines. Action of steam upon turbine buckets. Flow of steam through nozzles, orifices, and turbine passages. Effects of friction on flow. Types of steam turbines, and their operation.

Experiments in Thermodynamic Laboratory and local power plants.

Lectures—Monday, 8-9; *Tuesday,* 9-10.

Laboratory—D, *Wednesday,* 1-4; F, *Thursday,* 1-4, first term.

Professor Arkley and Mr. Conn.

Thermodynamics IV.

Advanced Thermodynamic Laboratory Work.

For students in Course F, fourth year.

This course consists of advanced engine and power plant testing.

Laboratory—Friday, 10-12, 1-4.

Professor Arkley and Demonstrator.

Thermodynamics V.

Elementary Power Plant Engineering.

For students in Course F, third year.

This course consists of a study of the design and action of slide, corliss, piston and poppet valves, etc., valve diagrams of fixed and reversible gears, engine governors. It also includes work on steam boilers; steam engines; pumps, and steam piping; mechanical stoking and the burning of pulverized fuel; compressed air, gas and oil engines; gas producers and locomotives.

This work is carried on in conjunction with draughting room exercises and practical valve setting on laboratory apparatus.

Lectures—Monday, 9-10 (b); 11-12 (a); *Wednesday,* 9-10.

Laboratory—Tuesday, 1-3. Professor Arkley and Demonstrator.

Thermodynamics Laboratory.

The Thermodynamics Laboratories are now divided into two sections, first the Internal Combustion Engine laboratory in Fleming Hall, and second, the steam laboratory located at the New Central Heating Plant on King Street. The equipment of the former includes a nine horsepower Diesel engine, a four stroke cycle oil engine, a two stroke cycle gasoline engine, a two cylinder Westinghouse gas engine directly connected to a generator and completely equipped for testing, a semi-Diesel Hoag engine, a six cylinder Buick motor car engine, an eight cylinder Ford motor car engine, a Chrysler 77 sectionalized engine and chassis, a Ford sectionalized engine and chassis, a modern motor driven air compressor, a Froude Brake and equipment for testing radiators and heating systems in the building.

The steam laboratory proper containing a number of types of steam engine, an air compressor, a condenser and pump, injector testing equipment, etc.

The work in this laboratory is given in connection with the Central Heating Plant where the auxiliary equipment such as steam turbines, centrifugal and reciprocating pumps, water tube and fire tube boilers and feedwater heaters are all available for study and investigation by the students, they having been designed with this object in view.

A valuable feature in connection with this plant is the study of different methods of heating as carried out from one Central Plant. The whole plant is conveniently equipped for making overal efficiency tests under practical working conditions.

The boilers are equipped with superheaters which makes investigations on the important question of superheated steam possible.

SHOP WORK

Instructors—A. C. Baiden, Machine Shop.

W. E. Connolly, Blacksmith Shop and Welding.

For students in Courses E, F, and G, second year; Course F, third year; Course D, fourth year.

Students in courses F and G shall enter any commercial works approved by the School and take a special course of shop training extending over a period of thirty-six weeks (18 weeks between second and third, and 18 weeks between third and fourth college years); or, in case accommodation cannot be secured, they shall attend a special course in the workshops of the school, extending over a period of 8 weeks (4 weeks preceding their third college year and 4 weeks preceding their fourth college year).

A student in Course H. shall enter any commercial works approved by the University and take a special course of shop training extending over a period of 12 weeks, between the second and third years of his course.

If a student enters a commercial machine shop to take his practical work, as indicated above, he must at the end of each term present a certificate from the manager of the plant stating the character of the work taken and the amount of time spent in the various departments.

The student must present the certificate to the Professor of Mechanical Engineering who has general supervision over all shop work.

A complete forge shop forms part of the equipment, so that efficient instruction can be given in machine shop practice, and in blacksmithing. The forge shop is located in the basement of the workshop building, and is equipped with the latest type of down draft forges, and electric drive for the blower and exhauster.

In connection with the work in blacksmithing a short course is now given in cutting and welding by the Oxy-Acetylene process. Five welding tables and one cutting bench have been installed and completely equipped with the most modern torches and other apparatus supplied by the Dominion Oxygen Company. Instruction is also given in electric welding.

Students in all courses will be given a course of practical work in workshops of the School as per schedule of courses.

Work Shop—Second year, E, F, and G, Sections 1-2, *Wednesday,* 1-4; Sections 3-4, *Tuesday,* 1-4; Sections 5-6, *Tuesday,* 9-12.
Third Year, F, *Saturday,* 8-11 (a), 9-12 (b).
Fourth Year, D, *Friday,* 1-4, second term.

DRAWING

Professor—A. Jackson, B.Sc.

Lecturer—H. J. Styles, B.Sc.

Demonstrator—A. O. Monk, B.Sc.

All drawings are to be drawn in the drafting room assigned. Drawings made by the students are considered the property of the department.

DRAWING I.

For all first year students.

Each student at the opening of the term must provide himself with a set of drawing instruments of approved standard.

The class standing will be determined by the term's work.

The work will consist of freehand lettering and sketching, geometrical drawings, auxiliary views, sections, screw threads, dimensioning, working drawings, assembly drawings, tracing, checking and blue printing.

Text-books—Svensen, *Drafting for Engineers.*
Svensen, Schumann and Street, *Drafting Problem Layouts.*

Sections 1-4, *Tuesday,* 9-12.

Sections 5-8, *Wednesday,* 9-12.

DRAWING II.

For students in Courses A, B, C, D, and M, second year.

The work will include structural and machine drawing, assembly drawings, detail drawings from free-hand sketches of details of machines, developed surfaces and intersections, tracing, checking and blue-printing.

The class standing is determined by the term's work.

Text-books—Svensen, *Drafting for Engineers.*
Svensen, Schumann and Street, *Drafting Problem Layouts.*

Secs. 1 and 2, *Friday,* 1-4; Secs. 3 and 4, *Wednesday,* 1-4.

DRAWING III.

For students in Courses E, F, and G, second year.

A more extended course than as outlined in Drawing II.

The class standing is determined by the term's work.

Text-books—Svensen, *Drafting for Engineers.*
Svensen, Schumann and Street, *Drafting Problem Layouts.*

Monday, 3-5, first term; *Thursday,* 9-12.

Projection

For first year students in all courses.

A course in the principles of Orthographic, Axonometric and Isometric Projection, and the projections of a solid revolved about different axes.

Also a short course in Descriptive Geometry preparatory to that subject in the second year dealing with problems involving true length of line and size of a plane, true slope of line and plane and projection of lines and planes on auxiliary planes.

Text-books—Svensen, *Drafting for Engineers.*
Warner, *Applied Descriptive Geometry.*

Sections 1-2, *Thursday,* 9-12.

Sections 3-4, *Friday,* 1-4.

Sections 5-6, *Thursday,* 1-4.

Sections 7-8, *Friday,* 8-11.

Descriptive Geometry

Required of all second year students.

This class continues the work in Descriptive Geometry which was taken in the class in Projection and includes solution of problems dealing with perpendiculars to lines and planes, intersections of planes, common perpendiculars to two lines, dihedral angles, angle between line and a plane, projections of plane figures and solids lying on a plane, mining and guide pulleys, tangent planes, revolution of lines and planes and perspective drawing.

Text-book—Warner, *Applied Descriptive Geometry.*

A, B, C, D, M, Secs. 1 and 2, *Tuesday,* 1-3; Secs. 3 and 4, *Thursday,* 1-3.
E, F, G, *Monday,* 1-3.

PHYSICAL EDUCATION

Medical Officer: Dr. J. T. Tweddell.

Physical Director: James G. Bews.

Assist. Physical Director: John F. Edwards, B.A.

Each first year student is given a careful examination by the Medical Officer at the beginning of his college course, the appointments being made on the day of registration. Corrective and remedial work is then given in the gymnasium when it is needed by the students.

With the exception of those excused by the Medical Officer because of ill-health, all first year students are required to take two hours of gymnasium work per week during the whole of the school year. The timetable for such classes is posted in the gymnasium very soon after registration and these classes may be taken voluntarily by any registered sophomore, junior, or senior in good standing. The work varies throughout the year and as much time as possible is spent outdoors in the early Fall and Spring. This consists of touch football, track and field, and softball, while every student is given a swimming test and the non-swimmers are automatically placed in an instruction group.

Indoor work follows with cooler weather and consists of swimming, Danish calisthenics, marching, setting up exercises, and apparatus work on the parallel bars, the side horse, the mats, and the horizontal bar. The winter term brings basketball, indoor softball, group games, and indoor track and field. Each student is encouraged to learn something about all of these activities and a wide variance of exercise is achieved.

Equivalent credit is given for attendance at regular organized swimming and life-saving classes, C.O.T.C. training, and for participation on university teams in track, football, basketball, hockey, water polo, gymnastics, tennis, and boxing and wrestling. Such credit TERMINATES WITH THE REGULAR SCHEDULED PROGRAMME OF ACTIVITIES OF EACH RESPECTIVE CLUB, when students will rejoin the weekly gymnasium classes or engage in any other of the sports listed above. At the start of the Fall term, each new student must report at the office of the Physical Director, located in the main gymnasium building.

MEDALS, SCHOLARSHIPS, AND PRIZES IN SCIENCE

Awarded 1938

Medals

Governor-General's Medal—K. W. Scobie, Hamilton, Ontario.

Departmental Medals:

Mining Engineering—T. M. Kerr, Vankleek Hill, Ontario.
Chemical Engineering—E. J. Wiggins, Trenton, Ontario.
Metallurgical Engineering—K. W. Scobie, Hamilton, Ontario.
Civil Engineering—A. D. McGinnis, Kingston, Ontario.
Mechanical Engineering—K. H. McKibbin, Kingston, Ontario.
Electrical Engineering—E. E. Bimm, Eganville, Ontario.

First Year Scholarships

The University Scholarships in first year Science—

Group A, value $100 each:

R. S. Rettie, Ottawa, Ontario.
J. M. Lynch, Trenton, Ontario
W. M. Martin, Heatherdale, Prince Edward Island.
E. E. Campbell, Toronto, Ontario.

Group B, value $75 each:

J. Van Damme, Arvida, Quebec.
J. A. Breadner, Ottawa, Ontario.
S. W. Breckon, Norwood, Ontario.
H. V. Smeltzer, Moose Jaw, Saskatchewan.

The W. W. Near Scholarship $100
R. S. Rettie, Ottawa, Ontario.

The Robert Bruce Scholarship ..... about $80
H. P. Thomas, Ottawa, Ontario.

The N. F. Dupuis Scholarship $50
J. M. Lynch, Trenton, Ontario.

The W. M. Moffat Scholarship $40
W. M. Martin, Heatherdale, Prince Edward Island.

Second Year Scholarships

The W. W. Near Scholarship $100
N. Z. Alcock, Vancouver, British Columbia.

The P. D. Ross Scholarship, No. 1 ..... $100
R. W. Kraft, Kitchener, Ontario.

The P. D. Ross Scholarship, No. 2 ..... $50
G. M. Wright, Kingston, Ontario.

The University Scholarships in second year Science—
Courses A B C D M, value $100 each:

R. W. Kraft, Kitchener, Ontario.
D. C. Brunton, Ottawa, Ontario.
G. M. Wright, Kingston, Ontario.
D. Caplan, Ottawa, Ontario.

Courses E F G, value $90 each:

N. Z. Alcock, Vancouver, British Columbia.
J. A. Jarvis, Ottawa, Ontario.

The J. M. Mowat Scholarship $40
J. A. Jarvis, Ottawa, Ontario.

Science '11 Scholarship $20
R. S. Lockeberg, Ottawa, Ontario.

W. H. Nichols Scholarship, No. 2 ..... $32
R. D. McQuire, Port Colborne, Ontario.

Third Year Scholarships

Kenneth B. Carruthers Scholarships—

Mining Engineering $110
J. A. McLaren, Niagara Falls, Ontario.

Metallurgical Engineering $110
J. G. Eby, Hamilton, Ontario.

Manley B. Baker Scholarship $125
J. O'Neill, Waterloo, Ontario.

W. W. Near Scholarships—

Chemistry $100
G. E. Monteith, Aylmer (West), Ontario.

Chemical Engineering $100
A. J. Gunn, Brantford, Ontario.

Civil Engineering $100
J. W. Brooks, London, Ontario.

The Joseph Abramsky Scholarship $50
G. V. Knowles, Ottawa, Ontario.

The Isaac Cohen Scholarship $100
E. W. Niergarth, Waterloo, Ontario.

The Reuben Wells Leonard Scholarship for highest standing in the penultimate year $200
J. H. Waghorne, Sarnia, Ontario.

Khaki University and Y.M.C.A. Memorial Scholarship $60
A. J. Gunn, Brantford, Ontario.

Susan Near Scholarships—

Mining Engineering $100
J. A. McLaren, Niagara Falls, Ontario.
L. S. Brooks, Paris, Ontario.

Chemical Engineering $100
A. J. Gunn, Brantford, Ontario.

Electrical Engineering $100
E. W. Niergarth, Waterloo, Ontario.

Physics $100
J. H. Waghorne, Sarnia, Ontario.

Prizes

Engineering Institute of Canada Prize $25
N. S. Edgar, Regina, Saskatchewan.

Fifth Field Company Prize $40
E. W. Niergarth, Waterloo, Ontario.

L. M. Arkley Prize $40
D. W. McKay, Portage La Prairie, Manitoba.

A. E. Segsworth Prize $40
A. N. Miller, Montreal, Quebec.

DEGREES AWARDED IN THE FACULTY OF APPLIED SCIENCE, 1938

Master of Science

Name	Address
*Dewar, D. J.	Ottawa, Ontario.
Gilbert, J. F.	Schumacher, Ontario.
Hay, R. H.	Stettler, Alberta.
Lazier, T. A.	Belleville, Ontario.

Bachelor of Science (Honours)

Bimm, E. E.	Eganville, Ontario.
Blay, R. A.	Sarnia, Ontario.
Bulbuk, S.	Marmora, Ontario.
Kerr, T. M.	Vankleek Hill, Ontario.
McGinnis, A. D.	Kingston, Ontario.
McKibbin, K. H.	Kingston, Ontario.
Pallister, E. G.	Ottawa, Ontario.
Reid, J. L.	Prince Albert, Sask.
Reid, T. L.	Prince Albert, Sask.
Scobie, K. W.	Hamilton, Ontario.
Sunnucks, D. C.	Hamilton, Ontario.
Wiggins, E. J.	Trenton, Ontario.

Bachelor of Science (Pass)

Abbott, A. J.	Guelph, Ontario.
Allan, R. G.	Toronto, Ontario.
Alton, W.	St. Catharines, Ontario.
Baker, R. D.	Lennoxville, P.Q.
Bayles, A. K.	Sault Ste. Marie, Ontario.
Beckham, J. W.	Hatchley, Ontario.
Berry, R. A.	Ottawa, Ontario.
Booth, C. R.	Ottawa, Ontario.
Boyd, W. E.	Newmarket, Ontario.
Bright, J. E.	London, Ontario.
Broadhurst, P. S.	Quebec, P.Q.
*Brown, C. E.	Windsor, N.S.
Brown, D. W.	Ottawa, Ontario.

*Indicates graduates of October, 1938.

Name	Address
Bruce, C. G.	North Vancouver, B.C.
Bulmer, J. S.	Cobden, Ontario.
Burton, R. H.	Rosetown, Sask.
*Cadario, H. P.	Lac Du Bonnet, Manitoba
Callum, J. P.	Sarnia, Ontario.
Campbell, A. M.	St. Thomas, Ontario.
Campbell, K. W.	St. Thomas, Ontario.
Carmichael, J. W.	Trenton, Ontario.
Cole, C. O.	Sarnia, Ontario.
Craig, C. E.	Kirkland Lake, Ontario.
Cunnington, D. W.	Calgary, Alberta.
Cuthbertson, C. C.	Windsor, Ontario.
Davis, H. A.	Dunrobin, Ontario.
Dixon, W. G.	Cobalt, Ontario.
Edwards, A. K.	Ottawa, Ontario.
*Ferguson, J. A.	Port Stanley, Ontario.
Ferguson, R. N.	Chatham, Ontario.
*File, H. A.	Napanee, Ontario.
Freeman, R. E.	Kingston, Ontario.
Godfrey, G. M.	Saskatoon, Sask.
Graham, E. P.	Red Deer, Alberta.
Halme, T. J.	Nipigon, Ontario.
Hames, C. A.	Oxbow, Sask.
Hill, J. A.	Hamilton, Ontario.
*Hilton, J. S.	Nassau, Bahamas.
Holmes, R. R.	Port Arthur, Ontario.
Janes, T. H.	Brantford, Ontario.
*Johnston, J. L.	Grafton, Ontario.
Keeley, W. D.	Schumacher, Ontario.
*Kennedy, J. W.	Copper Cliff, Ontario.
LeCaine, H.	Port Arthur, Ontario.
Lord, R. D.	Timmins, Ontario.
Martin, J. C. R.	Montreal, P.Q.
Miller, A. N.	Montreal, P.Q.
Mitchell, J. G. S.	New Carlisle, P.Q.
Morazain, J. F.	Quebec, P.Q.
Morgan, R. G. P.	Winnipeg, Manitoba.
Mumford, R. D.	Glencoe, Ontario.
McDonald, D. C.	Ruthven, Ontario.
McEwen, M. A.	Winnipeg, Manitoba.

*Indicates graduates of October, 1938.

Name	Address
McKay, D. W.	London, Ontario.
MacLeod, D. A.	Jarvis, Ontario.
MacMillan, D. C.	Ottawa, Ontario.
McRoberts, R. D.	North Bay, Ontario.
Neal, E. L.	Quebec, P.Q.
Nobbs, F. W.	Brantford, Ontario.
Papove, W. W.	Kamsack, Sask.
*Park, J. H.	St. Catharines, Ontario.
Patzalek, E. A.	Hamilton, Ontario.
Piuze, L. C.	Montreal, P.Q.
Poliskin, J.	Sydney, N.S.
Pugsley, R. L.	River Hebert, N.S.
Ramsay, R. D.	Sarnia, Ontario.
*Reid, J. W.	Lambton Mills, Ontario.
Reynolds, G. G.	Winnipeg, Manitoba.
Rice, F. G. H.	Huntsville, Ontario.
*Richardson, W. G.	Toronto, Ontario.
Ritzel, V. H.	Sault Ste. Marie, Ontario.
*Riverin, P. E.	Montreal, P.Q.
*Smallian, R. J.	Fort Frances, Ontario.
*Stark, R. G.	Ottawa, Ontario.
Stubbs, K. H.	Sarnia, Ontario.
Stubbs, T. L.	Sarnia, Ontario.
Traver, L. A.	Timmins, Ontario.
Tremblay, E.	Roberval, P.Q.
Vessie, I. D.	Ottawa, Ontario.
*Viberg, H. M.	Montreal, P.Q.
Vollmer, G. L. T.	St. Catharines, Ontario.
Walker, R. F.	Norwich, Ontario.
Warren, G. T.	Shawbridge, P.Q.
Webb, G. F.	Guelph, Ontario.
Williams, J. T.	Clandeboye, Ontario.
Williams, N. A.	Oshawa, Ontario.
Wilson, H. C.	Port Arthur, Ontario.
Wilson, J. P.	McGregor, Ontario.
Woodrow, W. R.	Hamilton, Ontario.
Wright, E. B.	Westport, Ontario.
*Young, C. T.	Windsor, Ontario.

*Indicates graduates of October, 1938.

TIME TABLE

FIRST YEAR—ALL COURSES

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Mon.	English I. Sects. 1-4 Phys. II. Lab. Sect. 5	Chem. I. Sects. 1-4 Phys. II. Lab. Sect. 5 Surv. I. Secs. 7-8	Math. IV. Sects. 1-4 Phys. II. Lab. Sect. 6 Surv. I. Sects. 7-8	Phys. I. Sects. 1-4 Phys. II. Lab. Sect. 6	English I. Sects. 5-8 Phys. II. Lab. Sect. 1 Surv. I. Sects. 3 4	Chem. I. Sects. 5-8 Phys. II. Lab. Sect. 1 Surv. I. Sects. 3-4	Math. III. Sects. 3-4 Math. IV. Sects. 5-8 Phys. II. Lab. Sect. 2	Phys. I. Sects. 5-8 Phys. II. Lab. Sect. 2
Tues.		Math. I. Sects. 5-8 Draw. I. Sects. 1-4	Math. II. Sects. 5-8 Draw. I. Sects. 1-4	Draw. I. Sects. 1-4	Math. II. Sects. 1-4 Chem. I. Sects. 5-8	Math. I. Sects. 1-4 Chem. I. Sects. 5-8	Chem. I. Sects. 5-8	
Wed.	English I. Sects. 1-4	Chem. I. Sects. 1-4 Draw. I. Sects. 5-8	Math. III. Sects. 1-4 Draw. I. Sects. 5-8	Phys. II. Sects. 1-4 Draw. I. Sects. 5-8	English I. Sects. 5-8 Chem. I. Sects. 1-4	Chem. I. Sects. 5-8 Chem. I. Sects. 1-4	Math. III. Sects. 5-8 Chem. I. Sects. 1-4	Phys. II. Sects. 5-8
Thurs.	Phys. I. Sects. 5-8 Phys. II. Lab. Sect. 3	Math. I. Sects. 5-8 Phys. II. Lab. Sect. 3 Projection Sects. 1-2	Math. II. Sects. 5-8 Phys. II. Lab. Sect. 4 Projection Sects. 1-2	Phys. II. Lab. Sect. 4 Projection Sects. 1-2	Math. II. Sects. 1-4 Phys. II. Lab. Sect. 7 Projection Sects. 5-6	Math. I. Sects. 1-4 Phys. II. Lab. Sect. 7 Projection Sects. 5-6	Phys. I. Sects. 1-4 Phys. II. Lab. Sect. 8 Projection Sects. 5-6	Phys. II. Lab. Sect. 8
Fri.	Math. III. Sects. 1-2 Projection Sects. 7-8	Chem. I. Sects. 1-4 Surv. I. Sects. 5-6 Projection Sects. 7-8	Math. IV. Sects. 1-4 Surv. I. Sects. 5-6 Projection Sects. 7-8	Phys. II. Sects. 1-4 Chem. I. Sects. 5-8	Math. III. Sects. 5-8 Surv. I. Sects. 1-2 Projection Sects. 3-4	Surv. I. Sects. 1-2 Phys. II. Sects. 5-8 Projection Sects. 3-4	Math. IV. Sects. 5-8 Projection Sects. 3-4	Engineering Society
Sat.								

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Mon.		Miner. I. A.B.C.D.M., 1, 2 Genl. I. A.B.C.D.M., 3, 4 Phys. III. E.F.G.	Math. V. A.B.C.D.M., 1, 2 Phys. XIV. (a) A.B.C.D.M., 3, 4 Genl. I. E.F.G.	Genl. I. A.B.C.D.M., 1, 2 Math. V. A.B.C.D.M., 3, 4 Math. V. E.F.G.	Miner. I. A.B.C.D.M., 1, 2 Phys. XIV. (a) A.B.C.D.M., 3, 4 Descrip. Geom. E.F.G.	Miner. I. A.B.C.D.M., 1, 2 Miner. I. (b) A.B.C.D.M., 3, 4 Phys. XIV. (a) A.B.C.D.M., 3, 4 Descrip. Geom. E.F.G.	Phys. XIV. (a) A.B.C.D.M., 1, 2 Miner. I. A.B.C.D.M., 3, 4 Phys. IV. (b) E.F.G., 1, 2 Drawing III. (a) E.F.G.	Phys. XIV. (a) A.B.C.D.M., 1, 2 Miner. I. A.B.C.D.M., 3, 4 Phys. IV. (b) E.F.G., 1, 2 Drawing III. (a) E.F.G.
Tues.	Phys. XIV. A.B.C.D.M., 1, 2 Surv. II. E.F.G.	Geol. I. A.B.C.D.M. Surv. II. E.F.G., 1, 2, 3, 4 Shop Work E.F.G., 5, 6	Phys. XIV. A.B.C.D.M., 3, 4 Surv. II. E.F.G., 1, 2, 3,4 Shop Work E.F.G., 5, 6	Qual. Anal. I. A.B.C.D.M. Surv. II. E.F.G., 1, 2, 3, 4 Shop Work E.F.G., 5, 6	Descrip. Geom. A.B.C.D.M., 1, 2 Phys. XIV. A.B.C.D.M., 3, 4 Shop Work E.F.G., 3, 4 Surv. II. E.F.G., 5, 6	Descrip. Geom. A.B.C.D.M., 1, 2 Phys. XIV. A.B.C.D.M., 3, 4 Shop Work E.F.G., 3, 4 Surv. II. E.F.G., 5, 6	Phys. XIV. A.B.C.D.M., 1, 2 Shop Work E.F.G. 3, 4 Surv. II. E.F.G., 5, 6	Phys. XIV. A.B.C.D.M., 1, 2
Wed.	Surv. II. A.B.C.D.M., 1, 2 Qual. Anal. I. A.B.C.D.M., 3, 4	Surv. II. A.B.C.D.M., 1, 2 Qual. Anal. I. A.B.C.D.M., 3, 4 Phys. IV. E.F.G.	Surv. II. A.B.C.D.M., 1, 2 Qual. Anal. I. A.B.C.D.M., 3, 4 Mech. IX. E.F.G.	Surv. II. A.B.C.D.M., 1, 2 Math. V. A.B.C.D.M., 3, 4 Math. V. E.F.G.	Math. V. A.B.C.D.M., 1, 2 Drawing II. A.B.C.D.M., 3, 4 Shop Work E.F.G., 1, 2 Phys. III. (a) E.F.G., 4, 5, 6	Drawing II. A.B.C.D.M., 3, 4 Shop Work E.F.G., 1, 2 Phys. III. (a) E.F.G., 4, 5, 6	Drawing II. A.B.C.D.M., 3, 4 Shop Work E.F.G., 1, 2	
Thurs.	Phys. XIV. A.B.C.D.M., 3, 4 Chem. II. E.F.G.	Geol. I. A.B.C.D.M. Drawing III. E.F.G.	Phys. XIV A.B.C.D.M., 1, 2 Surv. II. A.B.C.D.M., 3, 4 Drawing III. E.F.G.	Qual. Anal. I. A.B.C.D.M. Drawing III. E.F.G.	Qual. Anal. I. A.B.C.D.M., 1, 2 Descrip. Geom. A.B.C.D.M., 3, 4 Mech. IX. E.F.G., 1, 2, 3 Phys. IV. (a) E.F.G., 4, 5, 6 Phys. III. (b) E.F.G., 4, 5, 6	Qual. Anal. I. A.B.C.D.M., 1, 2 Descrip. Geom. A.B.C.D.M., 3, 4 Mech. IX. E.F.G., 1, 2, 3 Phys. IV. (a) E.F.G., 4, 5, 6 Phys. III. (b) E.F.G., 4, 5, 6	Qual. Anal. I. A.B.C.D.M., 1, 2 Phys. IV. (a) E.F.G., 1, 2, 3 Phys. III. (b) E.F.G., 1, 2, 3 Mech. IX. E.F.G., 4, 5, 6	Phys. IV. (a) E.F.G., 1, 2, 3 Phys. III. (b) E.F.G., 1, 2, 3 Mech. IX. E.F.G., 4, 5, 6
Fri.	Phys. IV. E.F.G.	Miner. I. (b) A.B.C.D.M., 1, 2 Genl. I. A.B.C.D.M., 3, 4 Phys. III. E.F.G.	Math. V. A.B.C.D.M., 1, 2 Miner. I. A.B.C.D.M., 3, 4 Genl. I. E.F.G.	Genl. I. A.B.C.D.M., 1, 2 Math. V. A.B.C.D.M., 3, 4 Math. V. E.F.G.	Drawing II. A.B.C.D.M., 1, 2 Qual. Anal. I. A.B.C.D.M., 3, 4 Phys. III. (a) E.F.G., 1, 2, 3 Phys. IV. (b) E.F.G., 5, 6	Drawing II. A.B.C.D.M., 1, 2 Qual. Anal I. A.B.C.D.M., 3, 4 Phys. III. (a) E.F.G., 1, 2, 3 Phys. IV. (b) E.F.G., 5, 6	Drawing II. A.B.C.D.M., 1, 2 Qual. Anal. I. A.B.C.D.M., 3, 4	Engineering Society
Sat.	Phys. XIV. (a) A.B.C.D.M., 1, 2 Phys. IV. (b) E.F.G., 3, 4	Qual. Anal. I. A.B.C.D.M., 1, 2 Surv. II. A.B.C.D.M., 3, 4 Phys. IV. (b) E.F.G., 3, 4	Qual. Anal. I. A.B.C.D.M., 1, 2 Surv. II. A.B.C.D.M., 3, 4 Chem. II. E.F.G.	Qual. Anal. I. A.B.C.D.M., 1, 2 Surv. II. A.B.C.D.M., 3, 4 Ast. II. E.F.G.				

(a)—First term. (b)—Second term.

THIRD YEAR A. B. C. D. M.

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Mon.	Geol. II. C.	Mining I. A. Quant. Chem. II. B. Geol. II. C. Met. III. (a) M. Elect. I. (b) D.M.E.	Mining I. A. Genl. Chem. III B. (b) Min. III. (a) B.C. Min. II. (b) C. Ind. Chem. II. D. (b) Elect. I. (a) D.M.E. Met. III. (b) M.	Met. II. A.B.M. Ind. Chem. II. D. (b)	Genl. III. A.E. Ind. Chem. II. B. Geol. X. C. Elect. I. D.M.	Genl. III. A.E. Ind. Chem. II. B. Geol. X. C. Elect. I. D.M.	Genl. III. D.M.F.G. Ind. Chem. II. B. Geol. X. C. Elect. I. A. Sects. 1, 2, 3, E.	Genl. III. D.M.F.G. German A. B.H. Geol. X. C. Elect. I. A. Sects. 1, 2, 3, E.
Tues.	Min. IV. A.C. Min. VII. M (a)	Mining I. A. (a) Elect. I. (b) A. Phys. Chem. I. B.C.D.M.	Mining I. A. (a) Geol. IV. (b) A. Biol. XV. (a) C. Ind. Chem. II. B.D. Met. III. (b) M.	Elect. I. (a) A. Genl. Chem. III B. (a) Met. II. (b) A.B.M. Mech. XII. (a) D.M	Quant. Chem. I. A., Secs. 1 & 2 Quant. Chem. II. B. (b) Phys. Chem. I. C.D.M., Sec. 1 Fire Assay A. (b), Secs. 3 & 4 M. (a), Sec. 2	Quant. Chem. I. A., Secs. 1 & 2 Quant. Chem. II. B. (b) Phys. Chem. I. C.D.M., Sec. 1 Fire Assay A. (b), Secs. 3 & 4 M. (a), Sec. 2	Quant. Chem. I. A., Secs. 1 & 2 Quant. Chem. II. B. (b) Phys. Chem. I. C.D.M., Sec. 1 Fire Assay A. (b), Secs. 3 & 4 M. (a), Sec. 2	Quant. Chem. II B. (b) Fire Assay A. (b), Secs. 3 & 4 M. (a), Sec. 2
Wed.	Met. II. (a) A.B.M. Ore Dress. (b) A.C.M.	Genl. V. A.D. Quant. Chem. II. B. Geol. II. C. Met. III. (a) M.	Elect. I. A., Sects. 4, 5, 6 Min. II. (b) C. Quant. Chem. I. D.M.	Elect. I. A., Sects. 4, 5, 6 Org. Chem. I. B.D. Genl. V. M.F.	Min. IV. A., Secs. 1, 2, 3 Geol. III. (b) C. A., Secs. 5 & 6 Quant. Chem. II B. Org. Chem. I. D. (a) Phys. Chem. I. M. (a), Sect. 2 Mech. III. D. (b), M. (b), F.	Min. IV. A., Secs. 1, 2, 3 Geol. III. (b) C. A., Secs. 5 & 6 Quant. Chem. II. B. Org. Chem. I. D. (a) Phys. Chem. I. M. (a), Sect. 2 Mech. III. D. (b), M. (b), F.	Min. IV. A., Sects. 4, 5, 6 C. Quant. Chem. II B. Org. Chem. I. D. (a) Phys. Chem. I. M. (a), Sect. 2 Mech. III. D. (b), M. (b), F.	Min. IV. A., Sects. 4, 5, 6 C. German A. B.H.

(a)—First term. (b)—Second term.

THIRD YEAR A. B. C. D. M.

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Thurs.	Min. IV. A.C. Min. VII. M. (a)	Mining I. (b) A. Phys. Chem. I. B.C.D.M.	Geol. III. (b) A.C. Ind. Chem. II. B.D. (a) Biol. XV. (a) C. Mech. XII. (b) D.M.	Ore Dressing A.C.M. Genl. Chem. III. B. Ind. Chem. II. D. (a) Chem. Eng. I. (b) D.	Quant. Chem. I. A.C.	Genl. V. M A., Sects. 1, 2, 3, 4 Quant. Chem. II. B. Quant. Chem. I. C.D. A., Sects. 5 & 6 Geol. VII. (b) C.	Genl. V. M. A., Sects. 1, 2, 3, 4 Quant. Chem. II. B. Quant. Chem. I. C.D. A., Sects. 5 & 6 Geol. VII. (b) C.	Genl. V. M. A., Sects. 1, 2, 3, 4 Quant. Chem. II. B. Quant. Chem. I. C.D. A., Sects. 5 & 6
Fri.	Elect. I. A. Min. III. (a) B. Thermo. I. D.M.E.F.G.	Min. III. (a) B. Geol. II. C. Chem. Eng. I. D. (b) Org. Chem. V. M.	Thermo. I. A. Min. III. (a) B.C. Elect. I. D.M.E.	Geol. IV. (a) A. Geol. III. (b) A.C. Org. Chem. I. B.D.	Geol. III. (b) A., Sects. 3 & 4 Genl. V. A, Sects 5 & 6 D.F. Quant. Chem. I. M. Phys. Chem. I. B. Min. III. (a) C.	Geol. III. (b) A., Sects. 3 & 4 Genl. V. A, Sects 5 & 6 D.F. Quant. Chem. I. M. Phys. Chem. I. B. Min. III. (a) C.	Geol. III. (b) A., Sects. 1 & 2 Genl. V. A, Sects 5 & 6 D.F. Quant. Chem. I. M. Phys. Chem. I. B.	Geol. III. (b) A., Sects. 1 & 2 German A. B.H. Engineering Society
Sat.	Fire Assay A, Sects. 1 & 2 (a) Sects. 5 & 6 (b) M, Sect. 1 (a) Quant. Chem. I. A., Sects. 3 & 4	Fire Assay A, Sects. 1 & 2 (a) Sects. 5 & 6 (b) M, Sect. 1 (a) Quant. Chem. I. A., Sects. 3 & 4 Org. Chem. I. B.D. (b) Ind. Chem. II. D. (a) Phys. Chem. I. M (b), Sect. 2	Fire Assay A, Sects. 1 & 2 (a) Sects. 5 & 6 (b) M, Sect. 1 (a) Quant. Chem. I. A., Sects. 3 & 4 Org. Chem. I. B.D. (b) Ind. Chem. II. D (a) Min. II. (b) C. Phys. Chem. I. M (b), Sect. 2	Fire Assay A, Sects. 1 & 2 (a) Sects. 5 & 6 (b) M, Sect. 1 (a) Org. Chem. I. B.D. (b) Ind. Chem. II. D. (a) Min. II. (b) C. Phys. Chem. I. M (b), Sect. 2			

(a)—First term. (b)—Second term.

THIRD YEAR E. F. G. H.

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Mon.		Elect. I. (b) D.M.E. Elect. IV. (a) F. Thermo. V. (b) F. Elect. III. (a) G. Elect. VI. (b) G.H.	Elect. I. (a) D.M.E. Mun. I. (b) E. Mech. I. F.G. Phys. VII. H.	Ry. I. E. Mech. II. (b) F.G. Thermo. V. (a) F.	Genl. III. A.E. Phys. VI. (b) H. Phys. VII. (b) H.	Genl. III. A.E. Phys. VI. (b) H. Phys. VII. (b) H.	Genl. III. D.M.F.G. Elect. I. A. Sects, 1, 2, 3, E.	Genl. III. D.M.F.G. Elect. I. A. Sects, 1, 2, 3, E. German A. B.H.
Tues.	Math. XI. H. (b)	Hydraulics I. E.F.G.	Met. I. (a) E.F.G. Mun. I. (b) E. Elect. IV. (b) F. Elect. III. (b) G. Phys. VI. (b) H.	Genl. II. E. Mech. I. F.G.	Mun. I. (b) E. Surv. III. (a) E. Thermo. V. F. Elect. II. G.H.	Mun. I. (b) E. Surv. III. (a) E. Thermo. V. F. Elect. II. G.H.	Mun. I. (b) E. Surv. III. (a) E. Elect. IV. F. Elect. II. G.H.	Elect. IV. F.
Wed.	Hydraulics I. E.F.G.	Genl. VI. E. Thermo. V. F. Elect. II. G.H.	Surv. III. (a) E. Math. VI. (a) F.H. Math. VII. G. Phys. VII. H.	Geol. IX. E. Genl. V. M.F. Elect. III. G.	Mech. III. D. (b), M. (b), F. Ry. I. E. Phys. V. G.H.	Mech. III. D. (b), M. (b), F. Ry. I. E. Phys. V. G.H.	Mech. III. D. (b), M. (b), F. Ry. I. E. Phys. V. G.H.	Met. I. (b) E.F.G. German A. B.H.

(a)—First term. (b)—Second term.

THIRD YEAR E. F. G. H.

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Thurs.	Elect. IV. F. (b) Math. XI. H. (b)	Struct. I. E. Phys. V. (a) G.H. Elect. VI. (b) G.H.	Genl. II. E. Elect. III. G. Phys. VI. (b) H.	Geol. IX. E. Elect. II. G.H.	Struct. I. E. Mech. III. F. Mech. VII. G.	Struct. I. E. Mech. III. F. Mech. VII. G. Phys. VII. H. (a)	Struct. I. E. Mech. III. F. Mech. VII. G. Phys. VII. H.	Phys. V. (b) G.H. Phys. VII. H. (b)
Fri.	Thermo. I. D.M.E.F.G.	Mech. II. (b) F.G.	Elect. I. D.M.E. Math. VI. (a) F.H. Math. VII. G. Phys. VII. H. (a)	Ry. I. E. Elect. IV. F. (a) Mech. II. (b) F.G.	Genl. VI. E. Genl. V. F.	Genl. VI. E. Genl. V. F.	Genl. VI. E. Genl. V. F.	German A. B.H. Engineering Society
Sat.	Shop Work F. (a) Math. XI. H. (b)	Shop Work F. Elect. III. G.	Shop Work F. Elect. III. G. Phys. VI. (b) H.	Shop Work F. (b) Elect. III. G.				

(a)—First term. (b)—Second term.

FOURTH YEAR

	VIII.	IX.	X.	XI	I.	II.	III.	IV.
Mon.	Mining II. A. Thermo. III. D.F. Metallography M. Math. X. (b) H.		Geol. V. A.C. Phys. Chem. II. B.D.M. Eng. Econ. E. Elect. VII. F. Elect. VIII. G.H.	Hydraulics II. F. Elect. V. G. Phys. IX. H.	Ind. Chem. III. B. (a) Chem. Opt. B. (b) Mining IV. C.M. Chem. Eng. III. D. Struct. II. E. Mech. V. F. Elect. X. G. Phys. XIII. H.	Mining II. A. Ind. Chem. III. B. (a) Chem. Opt. B. (b) Chem. Eng. III. D. Met. VII. M. Struct. II. E. Mech. V. F. Elect. X. G. Phys. XIII. H.	Ind. Chem. III. B. (a) Chem. Opt. B. (b) Chem. Eng. III. D. Met. VII. M. Struct. II. E. Mech. V. F. Elect. X. G. Phys. XIII. H.	German A. C. Chem. Eng. III. D. (b)
Tues.	Mining II. A. Phys. Chem. II. B.D.M. Hydraulics II. E.G.	Met. IV. A.M. Sci. Germ. B.H. Geol. VI. C. Thermo. III. D.F. Struct. IV. E. Elect. V. G.	Mech. IV. (a) A.D.E.G. Hydr. IV. (b) A. Phys. Chem. III. B. Struct. II. (b) E. Mech. V. F. Elect. X. G. (b)	Geol. VIII A.C. Org. Chem. II. B. Chem. Eng. IV. (b) D. Met. V. (a) M. Mun. III. E. Elect. X. G. (a) Phys. X. H.	Mining II. (a) A. Coll. Chem. I. (a) D. Coll. Chem. II. B. (a) Chem. Opt. B. (b) Fire Assay (b) C. Metallography M. (b) Min. VI. (b) M. Genl. IV. (a) E. Mech. V. (a) F. Mech. IV. (b) A.D.E.G. Hydr. III. (b) F. Elect. VIII. G.H. (a)	Mining II. (b) A. Coll. Chem. I. (a) D. Coll. Chem. II. B. (a) Chem. Opt. B. (b) Fire Assay (b) C. Metallography M. Min. VI. (b) M. Genl. IV. (a) E. Mech. V. (a) F. Hydr. III. (b) F. Elect. VIII. G.H.	Chem. Opt. B. (b) Fire Assay (b) C. Chem. Eng. III. D. (a) Metallography M. Min. VI. (b) M. Genl. IV. (a) E. Mech. V. (a) F. Hydr. III. (b) F. Elect. VIII. G.H.	Fire Assay (b) C. Metallography M. (a) Elect. VIII. G.H. (b)

(a)—First term. (b)—Second term.

FOURTH YEAR

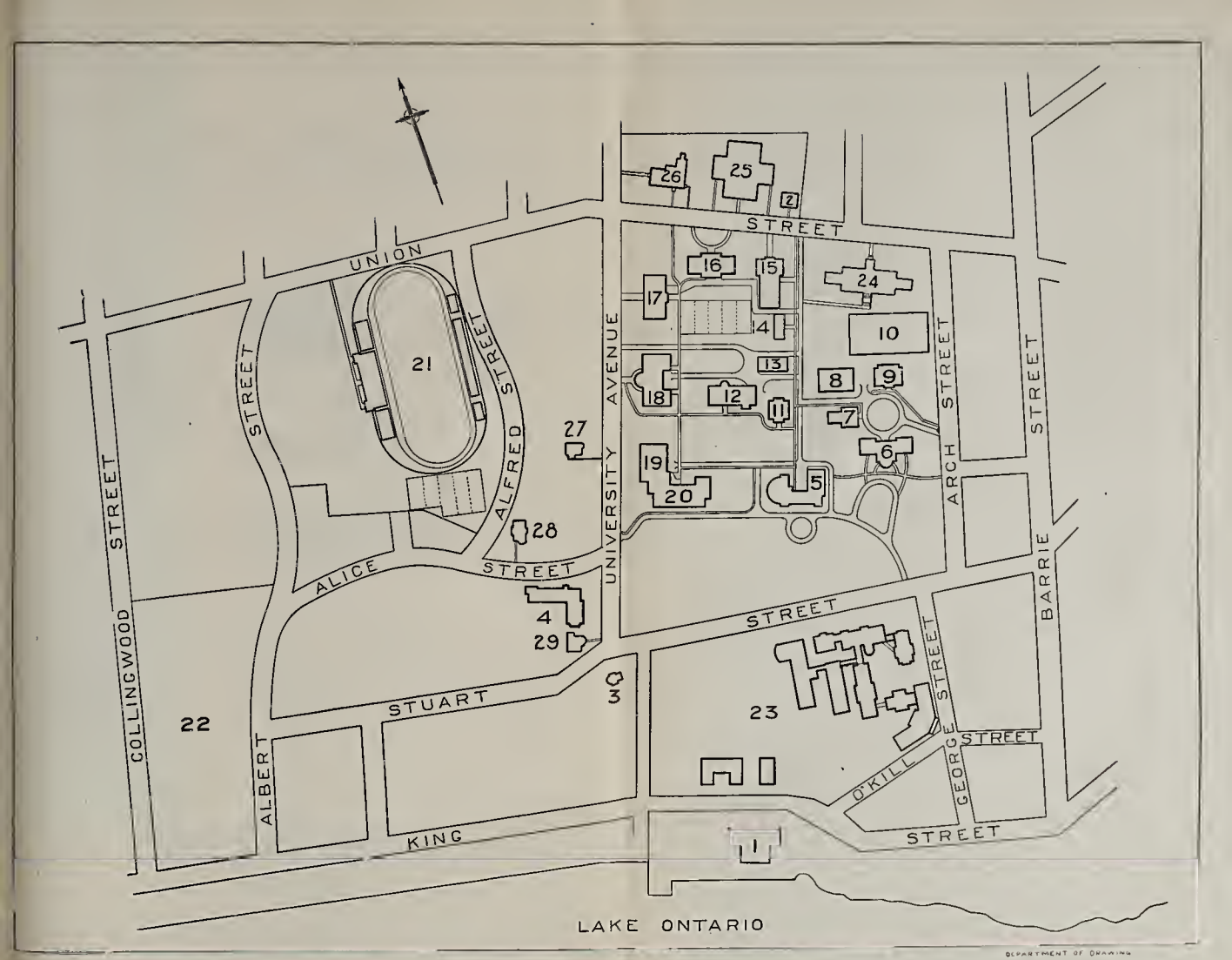
	VIII	IX	X.	XI.	I	II	III	IV
Wed.	Chem. Eng. IV. (a) D. Met. VI. (b) M.G. Mech. XI. (a) F. Math. X. (b) H.	Econ. I. A.B.C.D.M. E.F.G.H.	Mining II. A. Coll. Chem. II. B. (a) Coll. Chem. I. (a) D. Geol. XII. (a) C. Hydro. IV. (b) D.M. Ind. Chem. I. E. Mech. VI. (a) F. Mech. XI. (b) F. Elect. XII. G.H.	Met. IV. A.M. Ind. Chem. III. B. (a) Coll. Chem. II. B. (b) Min. V. C. Chem. Eng. II. D. Highway E. Mech. V. F. Phys. IX. H.	Mining III. A. Org. Chem. II. B. Thesis C. Thermo. III. (a) D. Chem. Eng. II. D. (b) Phys. Chem. II. M. Struct. IV. E. Elect. VII. F. Hydr. III. (a) G .	Mining III. A. Org. Chem. II. B. Thesis C. Thermo. III. (a) D. Chem. Eng. II. D. (b) Phys. Chem. II. M. Struct. IV. E. Elect. VII. F. Hydr. III. (a) G.	Mining III. A. Org. Chem. II. B. Thesis C. Thermo. III. (a) D. Chem. Eng. II. D. (b) Phys. Chem. II. M. Struct. IV. E. Elect. VII. F. Hydr. III. (a) G.	German A. C.
Thurs.	Econ. I. A.B.C.D.M. E.F.G.H.	Mech. IV. A.D.E.G. Geol. VI. C. Met. V. (b) M. Sci. Germ. B.H. Hydr. II. F.	Hydr. IV. A.D. (a), M (a) Chem. Eng. III. D. (b) Phys. Chem. III. B. Struct. II. E. Mech. VI. F. Elect. XII. G.H.	Met. IV. A.M. Org. Chem. II. B. Chem. Eng. IV. D. Mun. II. E. Mech. V. F. Elect. V. G. Phys. X. H.	Geol. VIII. A.C. Hydr. IV. (b) D.M. Met. Lab. M. (a) Highway E. (a) Mun. II. E. Mun. III. E. (b) Thermo. III. (a) F. Mech. VIII. (b) F. Elect. V. G.	Phys. Chem. II. B. D. Min. VI. (b) C. Met. Lab. M. Highway E. (a) Mun. II. E. Mun. III. E. (b) Thermo. III. (a) F. Mech. VIII. (b) F. Elect. V. G. Phys. X. H. (b)	Phys. Chem. II. B. D. Min. VI. (b) C. Met. Lab. M. Highway E. (a) Mun. II. E. Mun. III. E. (b) Thermo. III. (a) F. Mech. VIII. (b) F. Elect. V. G. Phys. X. H. (b)	Phys. Chem. II. B. D. Min. VI. (b) C. Met. Lab. M. (b) Phys. X. H. (b)

(a)—First term. (b)—Second term.

FOURTH YEAR

	VIII	IX	X.	XI	I	II	III	IV
Fri.	Hydr. IV. (a) A.D.M. Chem. Opt. B. (b) Met. VIII. (a) F. Math. X. (b) H.	Milling A.M. Chem. Opt. B. (b) Chem. Eng. III. D. Hydr. II. E.G. Met. VIII. (a) F.	Milling A.M. Coll. Chem. II. B. (a) Geol. XII. (a) C. Chem. Opt. B (b) Chem. Eng. III. D. Struct. IV. E. Thermo. IV. F. Elect. V. G.	Milling A.M. Ind. Chem. III. B. (a) Coll. Chem. II. B. (b) Min. V. C. Chem. Eng. II. D. Struct. IV. E. Thermo. IV. F. Phys. IX. H.	Milling A.M. Min. VI. (b) A. (Geol. opt.) Phys. Chem. III. B. Thesis C. Shop Work (b) D. Struct. II. E. Thermo. IV. F. Elect. V. G. Phys. XIII. H.	Milling A.M. Min. VI. (b) A. (Geol. opt.) Phys. Chem. III. B. Thesis C. Shop Work (b) D. Struct. II. E. Thermo. IV. F. Elect. V. G. Phys. XIII. H.	Milling A.M. Phys. Chem. III. B. Thesis C. Shop Work (b) D. Struct. II. E. Thermo. IV. F. Elect. V. G. Phys. XIII. H.	German A. C. Engineering Society
Sat.		Milling A.M. Org. Chem. II. B. Chem. Eng. II. D. (a) Hydr. III. E. (b) Mech. Eng. VIII. F. (b) Elect. XII. G.H.	Milling A.M. Org. Chem. II. B. Min. V. C. Chem. Eng. II. D. (a) Hydr. III. E. (b) Mech. Eng. VIII. F. (b) Elect. XII. G.H.	Milling A.M. Org. Chem. II. B. Min. V. C. Chem. Eng. II. D. (a) Chem. Eng. III. D (b) Hydr. III. E. (b) Mech. Eng. VIII. F. (b) Phys. X. (a) H. Elect. XII. G.H.				

(a)—First term. (b)—Second term.


UNION
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BARRIE
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PLAN OF QUEEN'S UNIVERSITY GROUNDS

1. Central Heating Plant
2. Commerce Building
3. Observatory
4. Ban Righ Hall
5. Old Arts Building
6. Principal's Residence
7. Old Medical Building
8. Hydraulics Laboratory
9. Medical Laboratory
10. Jock Harty Arena
11. Carruthers Hall
12. Fleming Hall
13. Technical Supplies and Storehouse
14. Mechanical Laboratory
15. Nicol Hall
16. Gordon Hall
17. Douglas Library
18. Ontario Hall
19. Grant Hall
20. Kingston Hall
21. Richardson Stadium
22. Leonard Field
23. Kingston General Hospital and Richardson Laboratory
24. Miller Hall
25. Gymnasium
26. Students' Memorial Union
27. Gordon House
28. Goodwin House
29. Macdonnell House